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A STATISTICAL STUDY
OF
INDIA'S INDUSTRIAL DEVELOPMENT

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(In collaboration with Dr. P. J. Thomas and published by the Madras University)

INDIAN AGRICULTURAL STATISTICS

COMMODITY PRICES IN SOUTH INDIA

A STATISTICAL STUDY of INDIA'S INDUSTRIAL DEVELOPMENT

by

Dr. N. S. R. SASTRY,
M.A M Sc Ph D (Econ.), F S S

*Ex-Lecturer and Head of the Department
of Statistics in the University
of Madras*

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BOMBAY

Thesis approved for the degree of
Ph.D. (Econ.) of the London
University, 1943

To the memory of my father.

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FOREWORD

In this book, the author has made a scientific analysis of available statistical data for tracing the origin and growth of a selected number of large-scale industries. He has also incidentally commented upon the general economic conditions amidst which these industries have sprung up.

The book itself was originally got up as a thesis submitted to the London University in 1942 for which the author received the Ph.D. degree of that University in 1943.

The growth of large-scale industries was affected by the policies—political and economic—followed by the subordinate form of Government which hitherto ruled the country and which could not be accused of having shown undue favour to Indian industries. For the same reason the statistics were not available in the complete form usually maintained in self-governing countries including the British Dominions.

The author has taken up seven large-scale industries in this book for study. In the absence of any recognised series of industrial statistics, he has utilized other Government publications such as the Statistical Abstract of British India, Monthly Statistics of Selected industries, and the like, to base his explanations upon for the localization, growth, and productivity of each industry from stage to stage up to their present condition.

It is mainly the conditions under which an industry operates which are responsible for its efficiency and progress. The factual information in the book was collected from published statistical data and known recent business developments in the country.

The author has brought to bear on the publication a scientific viewpoint of industrial statistics, a firm grasp of current economic trends and a sound knowledge of the country's industrial and business conditions and practices.

The book will form a useful background for studies in planning and for designing new works or extensions to existing works.

Bombay, 9th July 1947.

M. VISVESWARAYA.

PREFACE

This work was completed and submitted as a thesis for a doctorate degree in the London University in 1942. It is not based on any primary investigations in the different industrial establishments, but is based on the data published in the Government blue books, reports of the Tariff Boards appointed to investigate into the desirability of granting tariff protection to important industries and such other secondary data as were available. The publication was delayed due to certain unavoidable circumstances created by the war. No doubt, the long interval makes certain conclusions of the thesis out of date. But for several reasons it was thought not expedient to change the form in which it was submitted for the degree. The statistical black-out maintained for security reasons till recently, the well-known time lag in the issue of official publications and the preoccupation of the author in other service were some of the chief reasons for the above decision. However, a short post-script is added to indicate the principal changes which have taken place during the war period. The present far-reaching changes in the political field will have repercussions in India's future economic conditions. The central and provincial governments have prepared plans for large-scale economic development and their execution should have great influence on the tempo of industrial development. But the resultant effect of all these factors should take some more time to crystallize, and one cannot have a proper perspective of their combined influence, till conditions become somewhat normal.

A number of books have been written by economists and publicists on the industrialization of India. Though they contain a large amount of numerical data, no attempt appears to have been made to analyse them statistically and to interpret the results. This gave rise to the criticism that they are coloured by the personal and political views of the authors. The object of this thesis is to make an analysis of the existing data regarding important large-scale industries in India, namely Cotton, Jute, Sugar, Iron and Steel, Cement, Paper and Coal, and to make a critical study of their progress in the present century. This study extends from 1900 to 1937; covering two important political periods, viz., the Minto-Morley and Montagu-Chelmsford reforms. The reforms under the Constitution of 1935 came into force only in 1937. Under the new Constitution, the Departments of Industries and Labour in all provinces came

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under the control of popular ministries. Hence, a study up to the eve of these changes is useful also from the historical point of view.

This study is confined only to seven large-scale industries in this country firstly because of their importance in the national economy and secondly because continuous data are not available for the whole period under consideration with regard to others. The study is divided into seven chapters. The first chapter gives a historical background ending with a note on the statistical data available. The problem of the Location of Industries is considered in the second chapter, and it is followed by the consideration of the Size of Industrial Units in the next. The fourth chapter deals with the progress made by the different industries in this period and it is followed by one dealing with Industrial Productive Activity and Industrial Fluctuations. The sixth chapter deals with Industrial Labour and the final one summarises the effects of the progress of industrialisation on the different aspects of national life.

Major portion of the work connected with the collection of data and analysis was done in the academic year 1938-39 in the London School of Economics under the direction of Dr. E. C. Rhodes. The author came to India in the summer of 1939 to collect some more data; but due to the outbreak of war it was not possible to return to England to complete the work. Hence, while writing the thesis the author could not have the benefit of the valuable direction and criticism of Dr. Rhodes and also did not have access to some important reference books which were not available in Madras. The author is grateful to Dr. Rhodes and the authorities of the London School of Economics for recommending the application for exemption of attendance for three terms and permission to submit the thesis from India, and to the authorities of the London University for acceding to this request.

The author is grateful to the authorities of the Madras University who made it possible to pursue this work by granting study leave in 1938 to go to London School of Economics for higher studies. He cannot adequately express his gratitude to Sir M. Visveswaraya who was kind enough to go through the book and write a foreword to it in spite of his advanced age and preoccupation with other work. Finally, he has great pleasure to acknowledge considerable help from Mr. C. V. Deekshitulu, B.A., M.L., Advocate, Madras, in preparing the manuscript of the thesis at a very short notice from the London University; and to Mr. P. N. T. Chari for help in correcting the proofs, preparing the index, etc.

N. S. R. S.

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Chapter I

INTRODUCTION

1. HISTORICAL BACKGROUND

DECAY OF HANDICRAFTS—During the sixteenth and seventeenth centuries, India acquired a world-wide reputation for the excellence of her hand-made cotton fabrics. The superfine Dacca muslins and calicos were no less responsible for attracting the European traders to the country than the rich spices and other materials. But during the latter part of the eighteenth century, the invention of the spinning jenny and the steam engine in England brought in its wake increased application of mechanical power to the manufacturing industries, and the cotton industry was the first to be revolutionised by the new processes. By the early nineteenth century the factory system was firmly established in England and it gradually spread its influence on the continents of Europe and America. Though the products of machinery did not at first compare favourably with the artistic products of handicrafts, by a succession of inventions they improved in quality specially in standardised lines, and their cheapness helped them to displace Indian goods first in the foreign markets and later in the home markets even. The opening of the Suez Canal in 1869 and the great extension of cheap transport systems due to the rapid development of steamships and railways facilitated the conquest of the cottage industries by the factories.

These momentous developments in foreign countries had far-reaching repercussions on the Indian economic system. The decline of ancient industries from foreign competition was not followed by the introduction of the factory system due to the cumulative influence of several political, social and economic factors. Till India came under the Crown in 1857 it was in a very unsettled condition for want of a strong central government. Western education was not yet firmly established in the country, and the ignorance of modern scientific knowledge, which is the basis of the technical skill, was a handicap in the development of industries in the country. Moreover adequate supplies of coal and iron ore are the backbone of large-scale industries; but the coal resources in the country were not surveyed till the second half of the nineteenth century and the extensive rich iron ore deposits in the neighbourhood of the coal fields were discovered only early in this century. Over and above all these handicaps were the lack of adequate capital and enterprise among the people. These several factors contributed to the great delay in the establishment of large-scale industries in the country.

The opening of the railways and the development of inland and foreign commerce metamorphosed India's foreign trade. Early in the nineteenth century she ceased to export cotton piecegoods to Europe, and during the course of that century she developed trade in raw materials like cotton and jute, plantation crops like tea and indigo, food crops and oilseeds. In return she imported the manufactured goods like cotton piecegoods, metal products and other miscellaneous manufactures. Thus self-sufficient local economy was gradually displaced by international specialisation and trade, much to the disadvantage of the Indian craftsmen. They began to swell the ranks of agriculturists leading to the pressure of population on land which was accentuated by a series of famines in the latter half of the century. The seriousness of the situation was emphasized by the Famine Commission in 1880 when the following recommendation was made. "We have elsewhere expressed the opinion that the root cause of much of the poverty of the people of India and of the risks to which they are exposed in seasons of scarcity lies in the unfortunate circumstances that agriculture forms almost the sole occupation of the mass of the population, and that no remedy for the present evils can be complete which does not include the introduction of a diversity of occupation, through which the surplus population may be drawn from agricultural pursuits and led to find the means of subsistence in manufactures or some such employment."¹

BEGINNING OF LARGE SCALE INDUSTRIES

By the second half of the 19th century all the factors that handicapped the establishment of large-scale industries in this country lost their force. With the assumption of the Government of the country by the Crown in 1857, peace and security were established in the land, and the gradual increase in the foreign and inland trade led to capital accumulation. The introduction of the English language in the educational system, helped to train a large number of young men in modern scientific subjects which are necessary for gaining the technical knowledge required in industries, and also in business organisation and management on Western lines. The improvement of oceanic and inland transport systems encouraged the establishment of factories in the country, by affording facilities for obtaining machines and parts cheaply and quickly. Further foreign mechanics and engineers, who were required in the early years, to instal, operate and repair machinery could come to and go from the country at much less sacrifice of time, money and convenience. Following the rapid construction of railways, coal-mining began to be developed in Bengal and Bihar, and this supplied the necessary power.

The foundation for large-scale industries in India was laid by the establishment in Bombay of a cotton mill in 1853 by an enterprising Parsee merchant, Mr. C. N. Davar, and it was followed by a jute mill in 1855 at Rishra established by an Englishman Mr. George Aycland. The construction of the East Indian Railway through the coal regions of Raniganj in 1854, laid

1. Report of the Famine Commission, 1880, Vol. I, p. 175.

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the foundation for the mining industry. Though in the beginning, the cost of machinery and direction were high, the existence of raw materials and cheap labour compensated these disadvantages to some extent. The progress of the textile industries was very slow in the beginning; but the booms of 1875 and 1885 added special impulses to the enthusiasm born of the successes of the earlier attempts. The gradual extension of the railways increased the demand for coal, by the facilities created for the transport of this commodity to distant places and also by its increased use as fuel for the engines. In addition to the above some spasmodic attempts for establishing a few other factory industries were made about the same time. The first iron factory was established in Bengal in 1875, but it passed through several difficulties; and the next attempt was made only in 1907, when the Tata Iron and Steel Company was founded. A few other factories, e.g., woollen mills, silk mills, paper mills, etc., were also established. But cotton and jute mills and coal mines were the only three important large-scale industries in the country by the end of the 19th century and the number of people employed even therein was very small. Moreover these industries were concentrated in a few regions of the vast country.

This lopsided development of the industry and its slow growth can be explained with reference to several factors. In the earlier years local capital was too small to meet the growing demand of even agriculture and commerce, and people were more anxious to make easy and certain profits in these undertakings. Foreign capital flowed into plantations, railways, and monopolistic industries like jute, rather than into those industries which would compete with the imports from their own countries. The banking system was not well developed, and even the few banks in existence were more anxious to retain money for the harvesting seasons, when money was in demand, even at high rates, for the movement of crops, rather than to lock it up in long term investments of industrial undertakings. Thus the proverbial shyness of the country's capital and its dearth were the chief factors in retarding the growth of industries. But in Bombay the cotton merchants who made large profits during the American Civil War financed the cotton industry, and in Calcutta the English managing houses promoted the jute and coal industries. To add to this, labour was inefficient due to illiteracy, migratory nature and the insanitary conditions in which the workers had to live in the industrial towns. Lack of power resources in many parts of the country was another contributory factor. The coal resources were confined to a small area in northern India and hydro-electric schemes had not yet come into existence. Finally, the steel and engineering industries were not yet established and for even small machines and parts the country had to depend upon foreign imports.

PROGRESS DURING THE PRESENT CENTURY

A rough index of the progress of the industrial development of this country will be provided by the increase in the number of Joint Stock Companies for mills and mines and the amount of their share capital. The following

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table gives those details from 1900 to 1935. Care should be taken in interpreting these figures because the data for later years include some new areas which were not included in the figures for prior years.¹

Year. ²	Mills.		Mines.	
	Number.	Share capital. (Crores of Rs.)	Number.	Share capital. (Crores of Rs.)
1900	368	184	58	18
1901	356	187	67	20
1902	352	191	72	25
1903	361	188	74	26
1904	370	196	73	28
1905	407	204	80	30
1906	437	217	104	32
1907	485	235	165	42
1908	503	246	178	77
1909	504	264	184	86
1910	499	277	194	90
1911	496	276	203	105
1912	499	277	210	116
1913	518	295	217	119
1914	495	309	207	123
1915	484	314	210	118
1916	482	331	222	118
1917	478	353	240	124
1918	475	367	270	135
1919	619	395	336	151
1920	717	485	366	167
1921	740	648	386	317
1922	755	726	374	402
1923	748	747	364	418
1924	739	742	358	416
1925	738	726	344	418
1926	738	722	338	420
1927	741	714	330	400
1928	754	720	327	402
1929	761	716	335	396
1930	764	677	333	388
1931	786	684	331	390
1932	790	700	325	390
1933	845	701	384	406
1934	874	689	391	399
1935	924	671	399	404

1. British India, Mysore, Baroda and Gwalior (from 1919), Travancore (from 1920) and Hyderabad (from 1921).

2. Official year April to March.

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The above table shows three distinct landmarks in the progress of the industry during the present century, viz., (1) the Swadeshi movement of 1905-06, (2) the Great War of 1914-18 and (3) the Great Depression of 1930-31. Though the Swadeshi movement owed its origin to political causes, it instilled an industrial consciousness in the minds of the public, and encouraged the moneyed class to take to such undertakings. This resulted in a rapid increase in the number of mills from about 400 in 1905-06 to about 500 in 1908-09. During the war that followed there was stagnation and even a slight fall in the number of mills though the production went up. This was due to the difficulties in obtaining machinery and parts during that period. But immediately after the cessation of hostilities there was a great boom which synchronised with another political movement and several new mills were established; the number increased from 475 in 1918-19 to 717 in 1920-21 and 755 in 1922-23. Many of the thoughtless ventures came to grief and this period was followed by another one of stagnation. Subsequently the nationalist movement of 1930 synchronised with the protectionist policy of the Government and the number of mills increased from 764 in 1930-31 to 845 in 1933-34 and 924 in 1935-36. It will be noticed that during the whole period the share capital was increasing at a higher rate than the number of mills and in fact during the first Great War (1914-18) while the number of companies decreased, the share capital increased by nearly 20%. Mines also developed on the same lines as mills, but their rate of progress was much higher. The great increase in the share capital in 1921 without a corresponding increase in the number of mines is another noteworthy fact. For a proper understanding of the nature of industrial development we must have a knowledge of the growth of the different branches of the industry. This can be obtained best by taking censuses of industrial production at intervals. In India so far no such census has been taken. Attempts were made at the time of the censuses of population in 1911 and 1921 to record information regarding the industrial establishments with respect to power used and the number of persons employed only. But this was confined to large industrial establishments employing 20 or more persons in 1911 and 10 or more in 1921. No information regarding the output was collected. Even this meagre information was not recorded during the censuses of 1931 and 1941. But some idea of the number of employees can be obtained for these years also from the biennial publication "Large Industrial Establishments in India."

CENSUS OF 1911

At the time of the census of 1911 there were 7,113 industrial establishments employing 2,106 thousand people. Of these, 810 thousand were employed in plantation industries like tea, etc. Excluding them, the number employed in manufacturing industries and mines were 1,296 thousand. The following table gives the industries which employed more than 20 thousand people each:—

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	(In thousands.)
Cotton.	308
Jute.	222
Collieries.	143
Railway workshops.	99
Bricks, tiles, etc.	46
Rice mills.	42
Printing.	42
Gold mines.	29
Engineering.	23
	<hr/> 954 <hr/>

These nine industries thus account for nearly 75% of the industrial population. If we take into consideration the industries employing between 10 and 20 thousand people also, we bring in saw mills, stone and marble quarries, timber yards, iron foundries and petroleum refineries. We notice that cotton, jute and coal occupy the first three places and they are followed by railway workshops. Apart from them brick and tile factories, rice and flour mills, and printing presses dominate the industrial field. Even the small numbers under engineering represent only those engaged in assembling and repairing transport vehicles like motor cars, tram cars, cycles, etc., and small machines like lift pumps, flour and oil mills, etc., and those industries in which complicated processes are required are conspicuous by their absence.

During the Great War of 1914-18, the extreme dependence of India on foreign imports for most of her necessities was exposed in its nudity, and a large demand was created for Indian manufactured goods. This gave a good fillip to those industries which were already established. They were, however, unable to take full advantage of the situation on account of the lack of machinery. This dangerous dependence on imports for fundamental necessities of industrial life focussed the attention of the public and the Government on the need for a new constructive policy. In 1916 an Industrial Commission was appointed to examine and report on the possibilities of further industrial development in India and to submit recommendations for a permanent policy of industrial stimulation. The Commission reported in 1918 and the main recommendations for initiating a policy of energetic intervention in industrial affairs were (1) establishment of imperial and provincial Departments of Industry, (2) organisation of scientific and technical services, (3) affording greater facilities for industrial and technical education, and (4) alteration in the policy of purchase of stores by the Government. Even direct assistance was recommended by way of affording certain kinds of financial assistance and starting pioneer and demonstration factories. The first four recommendations were in the main accepted by the Imperial and Provincial Governments. In 1917, even before the Commission completed its investigations, the increased difficulties of obtaining stores and other materials for war, necessitated the appointment of the Indian

Munitions Board to control and develop Indian resources to the needs created by the war, to limit and co-ordinate demands for articles not produced in the country and to apply the manufacturing resources of the country for war purposes. The successful working of this Board helped to reinforce the recommendations of the Industrial Commission on several points.

CENSUS OF 1921

At the time of this census the number of people employed in industries and mines was about 1,860 thousand. A part of this increase of 564 thousand over the 1911 census was due to the inclusion of factories employing between 10 and 20 persons each. The industries which employed more than 20 thousand persons each are given below :—

(In thousands)

Cotton spinning and weaving mills.	351
Jute.	287
Collieries.	182
Railway workshops.	113
Cotton gins and presses.	83
Engineering.	82
Bricks and tiles.	75
Rice mills.	50
Printing presses.	49
Iron and steel.	39
Petroleum.	34
Quarries.	25
Sugar mills.	22

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Between 1911 and 1921 three important industries sprung up, viz., (1) cotton gins and presses (2) iron and steel works and (3) sugar factories. There was a great expansion under engineering works. Quarries and petroleum refineries came to employ more than 20 thousand people compared with 10-20 thousand in the previous census; part of this increase being due to the inclusion of small factories employing 10-20 persons each. But the general features of industrial pattern have not changed. The important engineering industries like manufacture of automobiles, ship-building, and the heavy chemical industries, etc., were conspicuous by their absence.

From the twenties of this century, industries were benefited by two important factors; (1) The imposition of heavy revenue duties to meet the large increase in expenditure served protective purpose for some of the existing industries and led to the establishment of new ones like the match and some other minor industries. (2) The change in the stores purchase policy of the Government of India, as a result of the

recommendations of the Stores Purchase Committee of 1920, stimulated indigenous industries by the encouragement given to their products by the Government. The imposition of customs duties on Government purchases also since 1924, and the institution of "Rupee Tenders" from 1928 acted as a direct stimulus to indigenous production. In addition to these factors, the acceptance of the principle of Fiscal Autonomy by the Secretary of State in a Dispatch dated 30-6-1921 and the recommendations of the Fiscal Commission which was appointed shortly afterwards led the Government of India to launch on a policy of discriminating protection. Almost all the major industries were investigated by Tariff Boards which made suitable recommendations and the measures taken on them by the Government were responsible for the subsequent progress of the Cotton, Iron and Steel, Paper, Cement and other industries, and the tremendous growth of the Sugar industry during recent years was a direct result of this policy. But protection was limited except in the case of the iron and steel industry to the industries engaged in the production of consumers' goods which had a ready market.

INDUSTRY IN 1931 AND 1937

The data for manufacturing industries is taken from the "Large Industrial Establishments in India," and for Mines from the Statistical Abstract of British India.

Industry.	(In thousands)	
	1937.	1931.
Cotton spinning and weaving.	569	416
Jute.	309	279
Cotton presses.	182	177
Railway workshops.	109	121
Quarries.	86	56
Sugar.	79	17
Engineering.	78	62
Rice mills.	44	33
Iron and steel.	42	31
Printing.	41	36
Jute presses.	36	30
Coal.	173	195
Petroleum.	26	7
Gold.	18	24

We notice that brick and tile industry has gone out of this list. This may be due to the fact that many of the brick factories are not governed by the Factories Act under which the data for this publication are collected. Jute presses are a fresh addition. We find that cotton presses, quarries and sugar have moved up in the scale. Engineering works, rice mills and printing recorded a fall in the number employed. This may partly be accounted for by the same reason as that given for brick and tile factories. But the general features of 1911 and 1921 still continued in 1937 also. The industrial development of India during these years can be described as one of the gradual displacement of imported consumers' goods by local production.

Thus we find that except for the iron and steel industry, there is at present hardly any organised industry manufacturing producers' goods, and industrial development is largely confined to the production of consumers' goods like cotton and jute manufactures, sugar, etc., or for processing agricultural materials like cotton and jute, e.g., gins and presses, rice mills, oil presses, etc., and mining and quarry works. Even for these industries, a good part of the chemicals, machinery and parts have to be imported from abroad. This dependence of industries on foreign countries for these supplies is resulting in increased cost of production and serious inconveniences during times of war in Europe. Even with the experience during the Great War of 1914-18, serious efforts were not made either by the Government or industrialists to fill up these gaps and during the present war it has again proved a great handicap for the Indian industries to take their full share of the advantages created by the war. Industries for producers' goods could have been established in India in the previous decades at less cost than what was incurred in the protection so far granted and they could have provided a sounder and broader basis of industrial development for the whole country. These key industries cannot be developed in competition with the advanced industrial countries without the active sympathy and support of the Government. In this connection, the views of Dr. John Matthai who was for a long time a member and later President of the Tariff Board are very useful.

"Key industries cover two classes. (1) Those industries the products of which are essential for the working of other industries, e.g., machinery and chemicals; (2) industries which are engaged in manufacturing articles which are directly in demand for defence purposes, e.g., glycerine, mineral jelly, ships, automobiles, aeroplanes, etc. Any measures adopted for assisting them should involve as little increase as possible in the cost of the product. In the case of the first set of articles it will hamper industrial development and in the other increase the burden of defence expenditure. The form of assistance generally acceptable and most suitable for such industries is the grant of bounties, either by itself or in combination with protective duties. It need not take the form of a subsidy to the industry, but can be granted in a variety of indirect forms, such as guarantee of interest, reduction of railway freight, remission of taxes on raw materials, preferential purchases by Government, leases or other concessions on favourable terms, provision of facilities for research, etc. The exact form must be examined in relation to the taxation and loan policy of the Government. The methods which have been found suitable for the development of industries producing consumers' goods will require substantial revision if key industries are to be fostered. A national industrial fund for financing more direct forms of assistance to industries must be created and this must be financed by loans raised by Government; or by proceeds of taxation. The present Board of Scientific and Industrial Research might provide the nucleus for the machinery required for administering the industrial fund. But this Board must be made more representative of industrial and commercial interests and its executive should possess more financial and administrative ability and experience. The scope of its activities should

extend far beyond the narrow limits of technical research and include the forms of assistance implied in the many sided character of modern industries."

2. INDUSTRIAL STATISTICS IN INDIA

In this note it is proposed to describe briefly the sources of the statistics of mineral and industrial production in India. Statistics of plantations like tea, coffee and rubber which usually go with Agricultural Statistics are not considered.

MINERALS

All the available information relating to minerals is published in the annual reports of the Chief Inspector of Mines, and the annual reviews of the mineral industry of India in the records of the Geological Survey of India. On account of the importance of coal, an annual report of the Indian Coal Statistics is published separately. Once in five years a quinquennial review of the mineral production in India is also published by the Director of the Geological Survey of India. These complete the sources of data regarding mineral production, summary tables of which appear in the annual volumes of the Statistical Abstract of British India.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MINES

This volume deals only with the British Indian Mines coming under the Indian Mines Act of 1923, and contains statistics of the number of mines (both opened and closed), the average daily number of workers, the output per head as well as the total output of the principal minerals. The average earnings of workers given in this volume relate to the month of December of each year in each important mining field. In addition, information relating to the death rates due to accidents and the number of ventilators and safety lamps, etc., in the mines are also given.

ANNUAL REVIEW OF MINERAL INDUSTRY (Records of the Geological Survey of India)

This volume provides information relating to the production in non-Act mines also, and statistics of the value of the production of important minerals. Figures of imports and exports of these minerals and of pig-iron are given. The statistics of consumption in the country of important minerals are included since 1933. In the quinquennial report, consolidated statements of the annual figures given in the above publication are published with an additional table showing the average number of persons employed. Wherever possible statistics of Indian production and exports and imports are compared with the corresponding figures for important foreign countries.

INDIAN COAL STATISTICS

This volume provides, as far as available, all data relating to India's Coal Production, exports, imports, and consumption classified according to

important categories. Information relating to the capital and labour employed in the industry is also given.

All the above information is received from the mine owners by the Chief Inspector of Mines in the case of those coming under the Act and for others through the concerned provincial authorities. But there is no staff to check the accuracy of the information supplied. Though the annual review published by the Geological Survey includes information relating to non-Act mines also, it should necessarily be incomplete, due to the fact that it is obtained on a voluntary basis. Several States do not have the necessary organisation, though British Indian Provinces supply more reliable information. The value figures should be more unreliable. However, the mineral requirements of the present war impressed both the Government and industry with the urgent necessity of exploring all resources and improving the accuracy of the published figures.

The figures of consumption of coal, published in the Indian Coal Statistics, are specially obtained from the Railway Board, the Indian Jute Mills Association, the steamship companies, the port trusts, certain mills and factory owners. These figures which do not lay claim to a high degree of accuracy, should be regarded as only approximate and very rough estimates. Further, in the figures of total consumption, Government stores and carry over are not taken into consideration. Efforts should certainly be made to make these consumption statistics more accurate by adopting uniform standards with respect to stocks, etc.

MANUFACTURING INDUSTRIES

The chief sources of information relating to the manufacturing industries are (1) Monthly statistics of cotton spinning and weaving in Indian Mills, (2) Monthly statistics of the production of certain selected industries in India and (3) The statistical abstract of British India.

MONTHLY STATISTICS OF COTTON SPINNING AND WEAVING

This monthly publication gives information on the production of yarn according to counts (less than 10, 10-20, 20-30, 30-40 and above 40) and of piecegoods according to chief categories, e.g., chaddars, dhoties, shirting, etc., for each month, as also for the period from 1st April to the end of the month, for the different Provinces and the States. The March number gives the total production for the complete official year. These figures are available from 1905-06. Figures of stocks in the mills as on 1st April each year are collected on a voluntary basis and published in the issue of the month of May. These statistics are based mainly on the returns furnished in accordance with the Cotton Industry (Statistics) Act. Figures prior to 1925 referred only to the quantities released from the mills after paying excise duty, whereas figures for subsequent years relate to actual production. Another serious defect in these figures is that the classification of woven goods is too crude to make any comparison with the imports of different varieties and judge the effects of protection on the competition with imports.

MONTHLY STATISTICS OF PRODUCTION OF CERTAIN SELECTED INDUSTRIES IN INDIA

This publication gives figures of production for the following industries:—(1) Jute, (2) Paper, (3) Iron and Steel manufactures, (4) Petroleum, (5) Kerosene, (6) Cement, (7) Wheat flour, (8) Paints, (9) Heavy chemicals, (10) Sugar, (11) Matches, and (12) Distilleries and Breweries. These statistics are based on data collected on a voluntary basis, except in the case of industries like Sugar, Matches, etc., which pay excise duty. Information relating to Wheat flour, Paints, and Heavy chemicals is generally incomplete. 'This publication was started' only in 1934, and provides figures from 1931-1932 onwards.

STATISTICAL ABSTRACT FOR BRITISH INDIA

This volume provides information for cotton, jute and woollen mills, with reference to their capital, number of spindles and looms, separately for British India and States. For paper, the number and mills, capital and total production are given and for breweries their number and total quantity of production only.

For sugar industry more comprehensive figures about stocks, trade, etc., are available from the *Indian Trade Journal* and a special supplement gives an annual review of the progress of the industry.

From the above account, we find that statistics of production of industries are available only to a limited extent; and for most of them the data are available only for recent years. Generally they are collected on a voluntary basis and hence are incomplete. The introductory notes of these publications indicate the extent of the coverage of the figures given. In this connection it may be pointed out that the figures given in publications of different years may show slight differences due to the revision of the figures.

In 1942, the Industrial Statistics Act was passed with a view to obtaining accurate statistics on a statutory basis, but it took nearly three years to make serious attempts to use the Act to collect information.¹ There are two fundamental difficulties in its enforcement; firstly, doubt is expressed whether section 3 (a) of the Act, can be invoked to obtain information relating to production, capital, raw materials, power equipment, cost of production, etc. These particulars are very useful and necessary to assess the industrial development of the country and the progress from period to period. Secondly, according to the Act, 'notices should be served on individual concerns to supply the necessary data. For large-scale industrial establishments collection of data is fairly easy, but for small-scale and cottage industries, this method will not be feasible. The only possible solution is the carrying out of intensive investigations of such small concerns once in five years, to estimate their progress, and obtain annual information for large-scale industries only. The chief recommendation of Bowley-Robertson Report for a census of industrial production has not been

1. Vide Appendix at the end of the Chapter.

so far carried out, though in the proposed rules for enforcement of the Statistics Act, a good part of the required information will be available for 31 factory industries.

Another important consideration in this connection is the necessity to dovetail statistics of production with those of trade. Though there are complete statistics of foreign import trade (specially sea-borne which is the most important), the classifications of production are not brought into a line with them to make suitable comparisons for assessing foreign competition. Internal trade figures are much worse in this respect and publication of rail-borne trade figures were even completely stopped between 1922 and 1934. Unless the accuracy of internal trade figures is improved, the commercial statistics will be quite incomplete and the progress cannot be properly assessed.

APPENDIX

Section 3 of the Act empowers Provincial Governments to collect statistics relating to any of the following matters from all factories as defined under the Factories Act.

Section 3: (a) Any matter relating to factories, (b) any of the following matters so far as they relate to welfare of labour and conditions of labour, namely:—(1) prices of commodities, (2) attendance, (3) living conditions including housing, water-supply and sanitation, (4) indebtedness, (5) rents of dwelling houses, (6) wages and other earnings, (7) provident fund and other funds provided for labour, (8) benefits and amenities provided for labour, (9) hours of work, (10) employment and unemployment and (11) industrial and labour disputes. Under this Act the statistical officer should be furnished at such intervals and in such form and with such particulars as may be prescribed, such information or returns relating to any matter in respect of which statistics are to be collected. Negligence or refusal to furnish information is subject to penalties under the Act.

Chapter II

LOCALISATION OF INDUSTRY

1. THE PROBLEM OF LOCATION

THE problems relating to the location of industry have been attracting the attention of the economists and administrators of different parts of the world only during recent years. Before the Industrial Revolution, when handicrafts were the means of production, there were few problems, because skilled workers used to manufacture, with local raw materials, products for the supply of neighbouring markets. Only a few goods of high value, which could be easily handled, entered into the trade with distant markets. But the inventions during and after the Industrial Revolution increased the productive capacity of individual plants, and the increased transport facilities bridged the distances between producing centres and markets. The division of labour and the consequent competition led to the geographical division of labour, and industries began to concentrate in particular places best suited for them.

The governments of different countries adopted a policy of *laissez-faire* with regard to location and left the choice to the industrialists. In his evidence before the Royal Commission on the Geographical Distribution of Industrial Population in Great Britain, the representative of the Board of Trade maintained that with certain exceptions individual choice had on the whole placed the industry where it was found to be economically most suitable. In the past, mistakes arising out of this policy did not seriously affect either the people or the government, because location was dictated by the existence of power resources in the form of coal, and transport facilities in the form of water-ways and railways which allowed little latitude for the individual to go wrong and even in a few cases of failure much havoc was not caused on account of the comparative smallness of the size of the plants. In recent years with the rapid development of electricity and road transport and certain other factors, a large number of industrialists are able to choose many sites which offer more or less equal chances of profitable production; and great mobility has been conferred on the industry. Any mistakes in location and consequent failure of giant concerns of the present day bring great distress to the large population of these regions. Rapid shifts of industry from some regions cause great hardships to the unemployed persons of those regions and the amenities and public utilities therein will become waste and burdensome. The new regions will be faced with the problems of providing amenities and public utility services for people gathering there. These difficulties have directed the attention of the administrator to the importance of proper location. Finally the search for a basis of rational

planning of uses of land, labour, etc., in increasing the productive capacity of each country has also brought this problem to the forefront.

The geographical distribution of industry in a country is determined by a great complexity of considerations, viz., natural, economic, technical, and sometimes psychological factors. In certain cases, historical accident has played an important part. In his evidence before the Royal Commission the representative of the Board of Trade pointed out that though natural conditions and certain other factors in Lancashire were admirably suited for cotton manufacture, "the industry first settled in Lancashire for no particular reason, except perhaps that the woollen industry was already there, that foreigners were kindly received and that Manchester was not a Corporation."¹ If by accident it had first settled in some other part of the country, or if Manchester had been subject to restrictive influences of the Corporations of these days it is possible that the history of the industry and of Lancashire should have been different. Similarly in the case of the woollen industry, which is now concentrated in West Riding, there were no decisive natural advantages to explain its growth.² In his evidence before the Royal Commission, the President of the Federation of British Industries summarised the main factors which appear to influence the choice of location as follows: (a) Proximity to market (b) presence of skilled labour at an economic price (c) situation of raw materials (d) situation of auxiliary materials (e) transport facilities (f) access to cheap fuel or other forms of power (g) amenities of particular sites (h) social amenities including housing facilities having regard to burden of rates, taxes, etc., and (k) personal. This list omits the favourable natural factors. "Instances of natural conditions as contributory factors occur in the climate of Lancashire in the cotton industry, availability of pure water for paper manufacture in Kent, and the tinplate manufacture in South Wales, etc. . . . The high degree of localisation of the airplane and motion picture industries in Southern California is largely explained by the unusual climate of that district. . . . It will thus be seen that in the location of the iron and steel and shipbuilding industries, natural conditions played a decisive part."³ But science and inventions have always come to the rescue of the industrialists in overcoming the restrictions set by natural factors.

We may consider the importance of the different factors in order. (a) The markets attract those industries whose products are costly to transport on account of fragility, perishability, or bulk. The production will also be near the market if the finished product is only slightly more expensive to carry than the raw materials. But goods of high value in proportion to the bulk are usually marketed over a wide area. Proximity to the market is of great importance to the lighter industries which have a considerable local demand. The large increase in demand for goods of lighter type has in recent years tended to strengthen the pull towards the markets.

1. P. 6, para 52; in the Evidence Volume of R. C. G. D. I. P. in Great Britain; Evidence of the Board of Trade.

2. Ibid., p. 32, para 72.

3. Ibid., p. 31, para 71.

The advantage of proximity to market is not only in the transport costs but also in the personal touch between the producers and the consumers. In addition, the increased demand for rapid and regular delivery of small consignments and the practice of offering after-sale services made it imperative for the producers to be near the consumers or at least to open branches in those centres. (b) In industries in which highly skilled or specialised labour is necessary, the location of the industry near a traditional center that has an adequate supply of labour of the requisite kind, is essential. In recent years the increased use of automatic machines shifted the importance from costly skilled labour to adaptable and relatively cheap labour. (c) Raw materials range from those hardly processed to those highly processed and may be home produced or imported. Nearness to raw materials is important in industries in which the final product embodies relatively little of the weight of the raw materials. Where several materials are combined into a single commodity, a predominant weight loosing material is likely to attract production to itself. In the case of imported materials nearness to the ports of import or financial connection with importers are important. (d) Of two places possessing raw material, the one which has auxiliary materials also or has a market for the by-products of the industry will have a greater pull on the industry. (e) Transport costs affect an industry both at the time of assembling the raw materials and when sending the products to the markets. A point of minimum transport costs is usually preferred. But reliability of supply is as important as the price. (f) In earlier years nearness to water-ways and later to coal was an essential consideration in setting up a plant. In recent years, electricity undermined the influence of coal except in those industries in which it is one of the chief ingredients. This has facilitated the expansion of industries in areas lacking coal, and also promoted the erection of factories in the outskirts of towns where land could be obtained cheaply. (g) Amenities offered by particular sites in regard to level of the ground, drainage facilities, disposal of waste products, etc., sometimes affect the location of the industries. Some industries require an adequate and steady supply of good quality water in the manufacturing processes, and in such cases nearness to such a water source is essential. Certain industries are incompatible as neighbours and offensive trades and explosive works should always be kept at a distance from human dwellings and other factories. Though accessibility to roads and railways is an important factor, industries which are affected by vibrations or dust must remain far from them. (h) Cheapness of the value of sites and the existence of public utility services sometimes attract industries to regions offering them. Availability of housing facilities and social amenities also encourage entrepreneurs to set up plants because the cost of providing the labourers with the same will be reduced. (k) Sometimes we find that the location is determined by fortuitous circumstances, such as the determination and the influence of an individual businessman.

Choice of location is therefore the result of weighing and assessing the relative importance of a number of factors, and leaves great scope for individual judgment for ultimate decision. Capital and Labour are primary

regulates, but these factors are mobile and are easily attracted to places which are most suitable otherwise. Variations among competing areas, in total costs, are affected in general by distance to points supplying raw materials and semi-finished goods, fuel and power charges, and markets. The main consideration of an entrepreneur is to choose such a place which makes the resultant effect of these factors lead to minimum costs of production. This may be achieved by fixing a place of minimum transport costs in assembling the raw materials and marketing the products, or a place where though the transport charges are higher, cheap labour, rents and taxes, etc., offer better attraction and compensate those extra charges. Apart from these regional factors, there are other elements of cost which yield benefits only through the "agglomeration" of the industry. However manufacturing economies of this type are not permanent because with the success of a venture in such a place other establishments of the same industry or of different industries will be attracted to that place thereby increasing the demand for those factors with consequent rise in their prices. Hence we may say that the most favourable location is determined by assembling and marketing costs.

The problem of location should not be taken to be of a static character, because the relative importance of the different factors changes with time, and a place ideally suited for an industry under particular circumstances ceases to be so with changes in the technique of production, means of transport, etc. The shifts in Geographical Distribution of Industries can very largely be explained by the changing cost factors. "Wage differentials and variations in the cost imposed by legislation have been important in causing intersectional movements. Another factor which helps to explain these interregional movements is variation in the extent of unionization of labour. This factor is related to differences in wage rates and may in fact lead up to such differences." In fact the shift of the American Cotton Textile Industry from northern to the southern provinces is mainly explained by these two factors. Shifts of distribution may also be explained by the changes in the importance of the different methods of transport. Places near canals or navigable rivers were valued when waterways were the chief means of transport, but when railway transport became more convenient, proximity to railway stations turned out to be the chief consideration, and now when carriage of goods by road has become the order of the day nearness to roads has become more important. Similarly improvement of transport facilities may widen the markets which influenced the location previously. Changes in location may occur when either the raw material of the industry is exhausted or when a rival substitute is found elsewhere. Thus an industry may shift to the raw material or shift with the raw material. Similarly it may shift to the market or shift with the market.

So far we have considered the factors which influence the location and those which cause the shifts in it. But the degree of concentration varies widely from industry to industry. On one end of the scale are industries whose products, on account of fragility, perishability, or costliness of transport, are widely dispersed and the degree of concentration is very low. A few examples of this category are building materials, furniture, bakeries,

mineral waters, etc. Proceeding further up the scale we find industries which are almost wholly localised in particular areas, namely, heavy metals, textiles, cutlery, shipbuilding, etc. In between, we find a very large number of industries with varying degrees of concentration. We can explain the differences in the degree of concentration on the basis of cost analysis. First considering transport charges, raw materials may be divided into two groups, (1) "ubiquities", i.e., those which are available everywhere like clay, water, etc., and (2) "localised materials" like minerals, cotton, etc., which are confined to particular regions. The latter influence towards concentration of the industries in which they are important while the industries depending on the former materials may be widely dispersed. Among the localized materials again some are "pure materials", i.e., those which impart their total weight to the product while others are "gross materials" which lose a lot of weight in the process of manufacture. The proportion of the localized materials to the final product which may be called "the material index" is an important factor influencing the degree of concentration. The higher the index, the greater the concentration of that industry at the centre of the raw material. Hence localized "gross materials" influence the concentration of the industry. But if two or more factors are used in the manufacture of a single product, and of these "ubiquities" add to the weight of the product, then the industry will be attracted to the centre of consumption. Hence the degree of concentration at the centre of raw materials or at the places of consumption depends upon the types of materials (ubiquities or localized) used and the nature of their transformation during the process of production (pure or gross). Turning to the labour charges, the proportion of labour costs to the total value of the product which may be called "labour coefficient", explains deviations from centres of minimum transport costs, when labour rates are different. Similarly the proportion to the total cost of factors in which external economies are important may be called "coefficient of manufacture"; and these factors will be important if their coefficient is high. But this concentration is also not of a static character and the degree of concentration of any industry may change with time. Hence the problem of localisation is essentially dynamic

2. THE MEASUREMENT OF INDUSTRIAL LOCALISATION

The validity of the deductive inference regarding the factors of location can be verified by an inductive analysis of the general pattern of the industrial distribution. "Localisation may be defined as the degree of dissimilarity between the Geographical Distribution of the Industry and the population."¹ For a study of the trends of localisation of the same industry in different periods of time, as also for a comparison of the degrees of localisation as between different industries, we must have some statistical measure of this concept. This requires in the first instance a division of the country into a number of homogeneous regions. Then the unit of measurement of each industry should be fixed. The various

1. *Review of Economic Statistics*, Oct. 1936.

measures that suggest themselves are (1) the value of the output of each industry (2) capital invested (3) power consumed and (4) number of people employed. The value of the output can be obtained by taking a census of production, but so far no such census has been taken in India. As regards capital, it depends upon the method of financing the industry, which varies from region to region and from industry to industry. Similarly with regard to power the difficulty is to aggregate the units using different sources of power, namely, coal, oil, and electricity. Hence we are left with the number of people employed in each region, as a measure of the distribution of industry in the different regions. But it should be remembered that due to improvements in technical processes and organisation, the output of industry may increase more rapidly than the number of people employed in it, and it may even increase while the number employed decreases. But when we have reasons to assume that these two factors do not vary widely in the several regions under consideration, the number of people can be taken as the unit of measurement. Two classes of statistics are available in respect of the distribution of industrial population. (1) Statistics of the population as a whole and of persons following a gainful occupation as ascertained at the time of census of population. (2) Average number of people employed in large industrial establishments and mines as published in the reports of the Government of India. The census figures are not useful because they are collected on a particular day once in ten years and intercensal figures are not available. On the other hand the second set excludes small industrial undertakings and there may be some lapses and inaccuracies even among those supplied. Moreover this restricts the study to the period after 1925 because the basis of collection has changed in that year and figures of the previous years are not comparable with those of the succeeding years. As there is no unemployment insurance in India, such figures as are available in England are not available in this country. Hence we have to take the second set of figures bearing in mind the limitations.

For each region we know (1) the percentage of the population therein to the total population of the country; and (2) the percentage of the workers in any industry therein to the total number of workers in that industry in the whole country. The ratio of these two quantities which may be termed the "Location factor" gives an idea of the relative importance of the different regions for the particular industry. The different regions can be arranged according to the ascending or descending order of the Location factor, and then the two variables can be aggregated. A graph of these sets of values gives the well-known "Lorenz" curve. The shape of the curve will be as shown in the diagram on page 20, if they are arranged according to the descending order of Location factor. The ratio of the area OANO to the area of the triangle OAB gives the coefficient of localisation, with respect to population. A similar device may be employed to find the coefficient with respect to any other factor namely (1) raw materials (2) other industries, etc. One defect of this coefficient is that it depends upon the arbitrary boundaries of the regions concerned. Accurate results will be obtained only by calculating it for very small regions.

For any industry in any region we know (1) the proportion of the total number of workers engaged in it therein to the total number in the industry throughout the country and (2) the proportion of the number of workers in the industry therein to the total number of workers in all industries in that region. An alternative method of measuring localisation is as follows: We can take for the location factor, the percentage of the national total of the given industry to be found in that region, to the percentage of all industries in the region. Then the coefficient of localisation may be taken as the weighted average of the absolute deviations of the location factor from (1), weights being proportional to the number of people employed in the regions. To put it shortly, subtract the regional percentage of all workers from the regional percentage of the workers in the industry in question, in all regions where the later is greater than (1). The sum of the differences divided by 100 is the coefficient of localisation. It is apparent that these coefficients also depend upon the boundaries of the regions.

We shall now apply the above methods to the distribution of industrial population in India and examine the results from the theoretical considerations given above. We shall consider only the chief basic industries, namely, "the industries which, for purposes of exchange, send products to places outside the area in which they are situated",¹ thus including mining and manufactures leaving out transport, marketing and distribution. The chief industries that will be considered are (1) Cotton, (2) Jute, (3) Sugar, (4) Iron and Steel, (5) Cement, (6) Paper and (7) Coal.

EMPLOYMENT IN LARGE INDUSTRIAL ESTABLISHMENTS IN INDIA (1000 persons)

Region.	Cotton Industry.				Sugar Industry.			
	1925.	1931.	1935.	1937.	1925.	1931.	1935.	1937
Bombay.	240.6	242.3	279.6	301.8	0.7	0.3	1.9	2.8
Madras.	29.1	36.4	55.3	64.2	3.4	2.2	3.3	3.5
The United								
Provinces.	21.8	29.5	38.2	41.3	4.6	9.6	42.0	44.6
The Central								
Provinces.	20.6	22.1	21.8	21.0	...	...	...	..
The Punjab.	1.6	2.5	2.5	4.6	0.1	0.5	2.2	1.5
Bengal.	13.4	18.0	27.9	27.5	0.1	...	3.3	3.2
Bihar & Orissa.	0.5	0.6	1.0	1.2	4.7	4.6	16.5	18.9
Ajmere-Merwara.	2.1	2.6	3.8	4.0	...	...	...	...
Delhi.	3.9	10.1	9.8	9.8	...	...	...	..
Hyderabad.	3.5	4.4	9.4	7.8	...	...	...	...
Mysore.	8.2	8.4	8.6	13.7	...	...	0.7	1.0
Baroda.	5.3	10.5	14.6	19.7	...	0.1	...	0.3
Central India								
States.	13.1	19.2	26.3	34.9	1.1

1. Vide Royal Commission's Report, p. 28, para 65.

LOCALISATION OF INDUSTRY

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Region.	1925.	1931.	1935.	1937.	1925.	1931.	1935.	1937.
Cotton Industry.				Sugar Industry.				
Rajputana.	0.4	0.4	1.1	1.5	...	...	0.2	.50
Madras States.	1.4	0.7	1.8	1.9	...	...	0.1	.20
Bombay States.	3.1	3.1	7.4	8.5	...	...	1.2	1.5
French Settlements.	5.0	5.4	5.8	5.5	...	...	...	...
Grand Total.	373.6	416.2	514.9	568.7	13.6	17.3	71.4	79.1
Jute Industry.				Iron & Steel Industry.				
Bengal.	338.3	268.3	263.4	287.7	5.9	6.7	9.4	16.9
Bihar & Orissa	..	0.5	4.7	6.3	31.3	20.2	23.2	22.4
Madras.	3.6	6.4	6.7	6.3	...	...	...	0.4
The United Provinces.	0.1	1.1	3.2	6.6	...	...	0.1	0.1
Mysore.	...	...	...	...	0.3	4.4	1.9	2.3
French Settlements.	2.6	2.8	3.0	2.7	..	...	...	..
Grand Total.	344.6	279.1	281.0	309.6	37.5	31.3	34.6	42.1
Coal Industry.				Cement Industry.				
Bihar and Orissa.	114.9	100.3	92.4	103.4	0.5	0.6	0.7	1.7
Bengal.	42.8	44.6	49.9	51.1	...	...	...	...
The Central Provinces.	9.2	8.6	13.1	11.9	1.4	1.1	2.4	3.1
The Punjab.	1.6	1.0	1.9	2.4	0.7	0.5	0.6	1.3
Assam.	4.2	3.5	1.8	2.1	...	..	0.3	0.2
Baluchistan.	1.0	0.2	0.1	0.4	...	...	...	...
Hyderabad.	12.7	10.5	10.6	12.3	...	0.7	0.7	0.9
Central India States.	2.8	1.9	2.5	2.6	...	...	...	...
Rajputana.	0.2	0.1	0.2	0.2	1.2	1.5	1.4	1.8
Bombay States.	...	...	...	...	0.5	0.6	0.5	0.5
Baroda.	...	...	...	...	...	0.3	0.4	0.5
Bihar States.	0.3	1.8	2.5	0.1	...	...	...	...
Central Province States.	0.5	0.5	4.0	...	...	...	...	...
Grand Total.	190.2	173.0	179.0	186.5	4.3	5.3	7.0	10.0

Paper Industry.

Region.	1925.	1931.	1935.	1937.
Bengal.	3.7	4.2	4.9	5.2
The Central Provinces.	0.7	0.7	0.9	1.0
Madras.	...	0.1	...	0.1
Bombay.	0.3	0.6	0.8	1.0
The Punjab.	...	...	...	0.7
Madras States.	0.1	0.1	0.1	0.1
Grand Total.	4.8	5.7	6.7	8.1

COTTON INDUSTRY

The following table gives the percentage of workers in the cotton industry in different regions during the years 1925, 1931, 1935 and 1937.

Region.	1925.	1931.	1935.	1937.
Bombay.	64.4	58.2	54.4	53.0
Madras.	7.8	8.8	10.8	11.3
United Provinces.	5.9	7.1	7.5	7.3
Central Provinces.	5.5	5.3	4.2	3.7
Bengal.	3.6	4.3	5.4	4.8
The Punjab.	0.5	0.6	0.5	0.8
Bihar.	...	...	...	0.2
Ajmere-Merwara.	0.6	0.7	0.7	0.7
Delhi.	1.0	2.5	1.9	1.7
Hyderabad.	0.9	1.1	1.8	1.4
Mysore.	2.2	2.0	1.7	2.5
Baroda.	1.4	2.5	2.8	3.5
Central India States.	3.6	4.5	5.2	6.1
Rajputana.	0.1	0.1	0.2	0.2
French Settlements.	1.3	1.3	1.2	1.0
Madras States.	0.4	0.2	0.3	0.3
Bombay States.	0.8	0.8	1.4	1.5

This is the oldest and biggest large-scale industry in India and is spread over all parts of the country; but still the degree of localisation is high, more than half of the employees being concentrated in the Bombay Presidency. Another fact that can be noticed is that the two old areas, Bombay and the Central Provinces, have been losing their share to other regions.

The chief factors which attracted the cotton industry to Bombay island and led to its subsequent development there, were (1) the existence of a big cotton market and businessmen who took interest in promoting this industry, (2) natural conditions of humid climate which was important for the industry before scientists invented humidifiers and (3) cheap transport

facilities for internal as well as external markets, and also for importing machinery, stores, accessories, chemicals, etc. It should be noted that the prosperity of the industry in earlier years depended on the large exports of yarn (especially of the coarse variety) to China and Japan. But when that trade was lost, the industrialists turned their attention to the manufacture of piecegoods for local markets. The nearness of raw material does not seem to be the main factor in determining the location of this industry. Though most of the mills are in the cotton growing regions, there are important cotton belts in the Punjab in the north and the Ceded Districts in the south which do not figure in this industry. This anomaly can be understood when we notice that England and Japan, the two leading cotton textile producers of the world, have to depend on imported cotton for their industry. Even in America, the northern provinces were the leading textile manufacturers for a long time, whereas the southern provinces produced the cotton. The concentration of a large number of mills in the same place led to other external economies and all these helped to make Bombay the leader of the industry in the country.

But later several factors operated to break this concentration. The supremacy of Bombay island was gradually lost to other centres, the most important of which was Ahmedabad. But since it is in the Bombay Presidency itself, this fact is not revealed by the above table. The extent of this change can be noted from the following figures giving average production per year during different periods.

PRODUCTION OF YARN—(Million lbs.)

		Bombay		Ahmedabad.		Rest of Bombay Pres.		Rest of India.		Grand Total Production.
		Production.	% of G. Total	Production.	% of G. Total	Production.	% of G. Total	Production.	% of G. Total	
Average	1901-04	326	57	45	8	46	8	159	27	576
"	1911-14	349	52	58	10	52	8	196	30	665
"	1919-22	336	50	79	12	53	8	195	30	663
"	1928-31	229	29	130	17	65	8	358	46	782
"	1934-37	282	27	169	16	77	8	510	49	1038
"	1937-38	331	28	184	16	77	7	568	49	1160

PRODUCTION OF PIECEGOODS—(Million yards)

Average	1901-04	293	54	102	19	47	9	99	18	541
"	1911-14	618	53	259	21	87	8	209	18	1173
"	1919-22	874	53	372	23	125	7	280	17	1651
"	1928-31	798	35	643	28	175	8	675	29	2291
"	1934-37	1139	33	990	28	213	6	1171	33	3513
"	1937-38	1376	34	1087	27	260	6	1361	33	4084

From the above tables we find that in the beginning of this century Bombay Presidency accounted for more than 70% of the production of yarn

and over 80% of piecegoods. Of the former the shares of Bombay island and Ahmedabad were 57 and 8 and of the latter 54 and 19 respectively. Since then till the end of the post-war triennium there has been a slow but persistent fall in Bombay's share in yarn, which was shared between Ahmedabad and other up country centres. But still it continued to be the chief producer with a share of more than 50%. Bombay's loss in yarn was chiefly due to the loss of export trade in yarn with China and Japan, and the increased production of piecegoods could not fully compensate this loss. In piecegoods it did not lose much ground because there was an expanding market for indigenous production in competition with imports.

But after this period, several new factors influenced the dispersion of the industry away from Bombay. The change in the direction of Bombay's trade from foreign to internal markets weakened its advantage in transport costs. Unfortunately for Bombay, about the same time the railway rates were revised from low rates over long distance from ports to a more equitable basis according to the distance travelled and this still further weakened its position in the internal markets. Again in the post-war period rents, taxes, water-rates and other charges for municipal services were raised in that city, and these contributed to an increase in the cost of production in that centre. All these factors tended to increase the burden on the industry in Bombay, and the situation was accentuated by the revival of imports from Lancashire and new competition from Japan. Ahmedabad and other inland centres had the advantage of lower freight charges for raw materials and finished goods, and the rents, taxes, and labour charges also were lower there. Again, the development of electric schemes in Madras and the United Provinces gave a fillip to this industry in those centres. Of all the inland centres, Ahmedabad came out best for several reasons. It is near the cotton growing tracts, specially of the medium and long-staple varieties, and has a big market in the neighbouring regions of Kathiawar, Gujarat, the Punjab, the United Provinces, Delhi, etc. It has, in addition, managing agents who confined their activities to a limited number of concerns and hence have more time to pay personal attention to many details. Fortunately, it could command a labour force which was more steady and less militant than that in Bombay. Also as most of the mills in Ahmedabad were newly established the machinery was modern and superior to those in Bombay.

With the growth of the external and internal competition many of the mills in Bombay came to trouble, and after 1923 the managements tried to reduce their costs at the expense of labour. This led to a series of labour strikes of greater or less intensity culminating in the great general strike of 1928-29 which shook the foundations of the industry in that centre. Ahmedabad and other inland centres seized this opportunity and increased their production at the expense of Bombay. By the end of the triennium 1928-31 Bombay's share in yarn came down to 27% compared with 57% in the beginning of the century, Ahmedabad's share increased to 17% from 8% and the share of other parts outside Bombay Presidency increased to 46% from 27%. In piecegoods the respective percentage shares were 35 and 54; 28 and 19; 29 and 18. Whereas all other centres increased their production of

yarn to nearly three times that of the earlier period, Bombay's share came down by nearly a third. In piecegoods, whereas other centres increased their production by nearly 6 times, Bombay could increase it only by 3 times.

The following figures show the average production per year of different varieties of yarn and piecegoods in the different regions.

YARN (million lbs.)

	Counts 1-20				21-30				31-40				above 40			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1901-04	284	16	34	145	38	21	11	12	3	8	1	2	...	...	...	...
1919-22	240	27	35	146	90	45	15	45	5	6	2	3	1	1	—	1
1928-31	136	48	40	239	72	60	19	97	15	15	4	14	6	7	2	2
1934-37	144	69	42	332	84	46	27	122	35	31	4	40	18	24	2	11
1937-38	143	68	42	355	102	45	26	130	54	39	7	52	30	33	3	19

(1) Bombay. (2) Ahmedabad. (3) Rest of Bombay. (4) Rest of India.

These figures show that Bombay's loss was confined only to the coarse varieties of less than 20 counts; in counts 21-30 it could not show much improvement after the war. But Ahmedabad and other centres gained in all varieties.

PIECEGOODS (million yards).

	Dhoties				Shirtings				Coloured goods			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1901-04	19	63	9	17	104	16	17	15	15	...	...	8
1919-22	13	177	43	64	280	107	31	45	338	31	29	60
1928-31	162	281	57	223	262	154	25	126	226	139	58	126
1934-37	331	321	68	436	375	203	37	254	218	312	65	192
1937-38	357	318	79	461	495	229	40	321	238	339	79	238

(1) Bombay. (2) Ahmedabad. (3) Rest of Bombay. (4) Rest of India.

These figures show that after the war, Bombay lost heavily in coloured goods and to a small extent in shirtings. In dhoties its production increased by nearly 80%. Ahmedabad and other centres improved in all lines.

The imposition of higher import duties in the emergency budget of 1931 and the granting of tariff protection to the industry in the subsequent years brought about new trends in the location. All the centres could expand their production at the expense of imports, and hence the relative shares had not shown any marked variation. But an important point to be noticed is that as the competition from centres nearer the markets had been increasing, the older centres like Bombay and Ahmedabad had been switching on to superior varieties of yarn and piecegoods. From the table given above it will be noticed that between the triennium beginning with 1928 and the triennium ending with 1938 Bombay increased its production

of coarse yarn below 20 counts from 136 million lbs. to 143 million lbs. per year, in counts 21 to 30 from 72 to 102, whereas in counts 31 to 40 it increased from 15 to 54 and in counts above 40 from 6 to 30 million lbs. Ahmedabad showed similar rapid improvement in fine counts and slight improvement in coarse counts less than 20; in counts 21-30 it actually lost 15 million lbs., i.e., from 60 to 45 million lbs. Though the mills outside Bombay also showed similar improvement, the share of fine yarn in their total production was much less than that of Bombay and Ahmedabad. Among piecegoods Ahmedabad improved much in coloured goods, followed by shirting and dhoties in order. Though Bombay improved tremendously its production of dhoties and shirting, in coloured goods it could not come back to the post-war record. Other centres showed improvement in all lines.

Thus it will be seen that Bombay and Ahmedabad had been trying to maintain their position of eminence in total production by specialising in higher qualities. Another important point to be noticed is that the shares of Bombay and Ahmedabad were greater in piecegoods than in yarn. This is due to the fact that most of the mills in the United Provinces and Madras manufacture only yarn for supplying to the handlooms. If these centres also begin to manufacture piecegoods and in addition Sind, the Punjab and Bengal which are the largest markets for the products of Bombay and Ahmedabad also enter the industry, the two older centres will feel the pinch. In fact, Ahmedabad had been showing the same tendencies as were experienced by Bombay in the twenties of this century. From all these considerations it will appear that there may be greater dispersion of the industry in future.

This situation offers an exact parallel to what had happened in the United States of America, as can be seen from the following extract:¹

"That the features of New England's natural environment are favourable for cotton manufacturing is shown by its past record in industrial history. Its bracing climate, its water power resources, accessibility to raw materials, fuel and markets by land and sea are significant in the final interpretation of the present role of its manufacturing activity; but their value translated into terms of current competitive endeavour is eclipsed by cheapness of southern labour, an economic factor which has checked further development in the north. Failure to reduce local taxation has been a contributing factor in the elimination of various mills specially in Massachusetts. New England surrendered its leadership in national cotton manufacturing which it held for upwards 130 years to the cotton growing states of south in 1925. Its chances of regaining that eminence are slight. Readjustments effected in the nineties taxed the shrewdness of mill-owners and managers, who successfully initiated a regime whereby fine goods were manufactured by an increasingly large number of mills. That New England by its longer experience can by means of its able management and skilled labour adjust itself to refinement of production is a fortunate circumstance, a response to natural environment which stimulates both

1. J. H. Burgy, *The New England Cotton Textile Industry*.

mental and physical activity. Competition from south had however also made inroads into the fine field especially in the medium fine counts, to which New England's attention has been largely restricted in the past 6 or 7 years on account of inadequate protection on finer yarns. This condition has been somewhat alleviated with the enactment of the Tariff Bill of 1930. The northern manufacturer recognises that his southern competitors can and are spinning these finer yarns and that the situation behoves his still greater emphasis on quality. If New England is to progress there must be an increased output and superior quality of production per operative. The manufacturer must produce goods cheaply and efficiently and be able to adopt his production to ephemeral style trends on short notice. There should be less divergence on wages between the north and south. The northern worker however should be paid higher wages than his southern brother because he turns out a superior product and in the second place the living expenses are higher."

The above extract is quoted at such length because it offers an exact parallel and tells the tale in India if therein north is replaced by Bombay and south by other parts of India. From the above account we find that though natural conditions and transport facilities played a great part in the location of the cotton industry in the earlier years, of late, market has been proving to be the dominant factor. This is especially so in the case with India where raw cotton is grown over large parts of the country. Still some centres have special advantages for finer varieties and superior kinds of cloth. The general trend seems to be towards greater dispersion.

JUTE INDUSTRY

The following table gives the percentage of workers in different regions to the total workers in the jute industry during the years mentioned.

	1925.	1931.	1935	1937.
Bengal.	98.2	96.0	93.6	93.2
Madras.	1.0	2.3	2.4	1.7
Bihar.	...	0.3	1.7	2.0
United Provinces.	...	0.4	1.2	2.1
French Settlements.	0.8	1.0	1.1	1.0

From this table we find that, this is a very highly localised industry, being concentrated mainly in Bengal. The chief factors responsible for this concentration were (1) raw materials, (2) power resources, and (3) transport facilities to markets. Bengal is the home of raw jute and in this commodity it holds a monopolistic position in the whole world. "It is in the great stretches of fertile land in Bengal where clay and sand are mixed with decayed vegetable matter, and where the overflow of the rivers leaves deposits which renew the soil year by year that the world's jute fields lie."¹ The availability of the raw material and power resources in the form of coal led to the development of this industry in Bengal. This

1. Report of the Royal Commission on Labour, p. 8.

industry depends for its prosperity on a vast overseas market, because more than 90% of the products are exported.¹ It enjoys unique transport facilities both for importing the raw materials and exporting the manufactured articles, because the jute mills on the Hoogly are very favourably situated for assembling the raw materials from the interior by numerous water-ways and exporting the finished goods by sea. Thus all factors made the banks of the Hoogly near Calcutta pre-eminently suitable for the growth of the industry.

Even in this industry the influence of the market can be noticed from the slight dispersion of the industry to Madras, the United Provinces and Bihar for meeting the local demand. The increased demand for jute goods in the United Provinces and Bihar after the development of the sugar industry in those provinces led to the establishment of small factories to cater to the needs of the local market. There is not much scope for wider dispersion because the internal demand is much smaller compared with the foreign and the mills in the interior cannot compete with those of Bengal in foreign trade on account of the latter's advantages in transport charges, trained labour forces and the strong financial position of a large number of the existing mills.

Thus we find that raw material and power resources played a decisive part in the location of the industry in Bengal and the good transport facilities for import of raw materials and export of finished goods to overseas markets added strength to its established position. In this respect it offers a contrast to the other textile industry, namely, cotton, which is not very much influenced by the presence of raw material but depends to a great extent on the internal market, leading to greater dispersion of the industry.

SUGAR INDUSTRY

The following table gives the percentage of workers in the different regions to the total workers in the sugar industry during the years mentioned.

	1925.	1931.	1935.	1936.
United Provinces.	33.7	55.1	58.7	56.4
Bihar.	34.6	26.4	23.0	23.9
Madras.	24.9	12.8	4.6	4.4
Bengal.	0.7	...	4.6	4.0
Bombay.	5.0	1.9	2.7	3.5
Punjab.	1.1	3.1	3.1	1.9
Mysore.	...	...	1.0	1.2
Baroda.	...	0.5	...	0.4
Bombay States.	...	...	1.7	2.0
Madras	...	...	0.2	0.2
Central India States.	...	...	0.1	1.4
Rajputana.	...	...	0.3	0.7

1. *Growth of Industry and Trade in Modern India* by Vakil and others.

This table reveals two interesting facts: (1) the industry has been spreading to all parts of the country and (2) at the same time the concentration tended to increase between 1925 and 1935. This apparent paradox can be understood when we notice that this industry developed rapidly after the imposition of the high revenue duties of 1930 and 1931 and chiefly after the tariff protection of 1932. The trends before that year need not be taken seriously as the magnitude of the industry at that time was relatively small. The chief factors which influence the location of the sugar industry are (1) the existence of sugarcane in sufficient quantities within easy reach to run an economic plant and (2) the availability of transport facilities to carry the cane to the factories. These two factors are very important because any delay in the time of transportation of cane from field to the factory causes loss in the sacrose content of the cane. Next in order of importance comes the influence of the market. Power resources do not appear to influence the location of this industry because the bagasse left after the pressing of the juice from the cane is the chief fuel.

Whereas in other parts of the globe sugarcane is extensively grown in the tropical regions like Java and the West Indies, the principal sugarcane producing areas in India are confined to the sub-tropical regions of Northern India, where 90% of the cane is grown compared with 8% in the tropical regions of the south. In this respect it suffers from several disadvantages because the cane crop is subject to extreme variations of temperature and liable to attack from diseases and insect pests,¹ and the yield per acre is also smaller there than in the tropical regions.² But the rich alluvial soil of the gangetic plain confers an initial advantage on the sugar producing areas of the United Provinces and Bihar, which outweighs to some extent the climatic advantages of other regions. Other contributory factors for the small progress of sugarcane cultivation in the tropical regions were the high costs of cultivation, especially in the Deccan canal region of Bombay, and the large range of competitive cash crops like jute in Bengal, and groundnut, cotton, plantains, chillies and tobacco, apart from the staple food crop paddy, in South India. The agricultural factors which control the production of cane in certain areas were the lack of irrigation resources for providing a constant supply of water for a long period, and drainage facilities.

Along with the production of sugarcane and raw sugar or 'gur', indigenous methods of manufacture of white sugar, called khaudasari, were prevalent in the United Provinces for a long time. Some attempts were made to

1. N. C. Mehta's convocation address to the Imperial Institute of Sugar Technology—M. P. Gandhi's *Sugar Annual*, 1938, p. 102.

2. Average yield per acre (vide Sugar Supplement, *Indian Trade Journal* for 1937-38).

	(in tons)	
	1936-37	1937-38
United Provinces	3,226	3,386
Bihar	2,332	2,401
Madras	6,103	6,224
Bombay	5,484	5,446

foster the growth of factory production in the post-war period; but these failed on account of the competition from foreign imports. But with the granting of tariff protection, the industrialists in the United Provinces and Bihar, which are the chief cane producing areas, who had already some experience in indigenous and factory production, established sugar factories. They had the advantage of having large tracts of sugarcane fields in the neighbourhood, to supply the needs of large-scale production. They had also the added advantage of a big market for their production in Northern India itself, and both these factors were more favourable to the United Provinces, which explains its larger share. Though the Punjab has the biggest market, and is second only to the United Provinces in the area under sugarcane cultivation, the industry there met with little success. This is due to the adverse climatic conditions and frost, which reduce the sacrose content of the cane, as a result of which the factories cannot effectively compete with those of the neighbouring United Provinces.²

Though the United Provinces and Bihar have so far maintained their position as the chief sugar producing areas, several new factors had been operating to stimulate the growth of the industry in other parts of the country. The disastrous fall in the price of jute during the recent economic depression and the subsequent schemes of restriction of the area under that crop, led to some increase in the area under sugarcane and the establishment of factories in Bengal. But the recent rise in the price of jute due to war may check this growth for sometime. Similarly the fall in the price of rice in the thirties directed the attention of South Indian cultivators to sugarcane and this led to the establishment of a few factories here and there in the South. The irrigation schemes of the Governments of Mysore and Hyderabad encouraged the growth of sugarcane and supplied the impetus for starting factories in those areas. In addition to the higher yield and longer duration of the season, the factories in South India have the added advantage of the availability of gur or jaggery manufactured from palmirah and cocoanut trees, for refining into sugar during off season and this

1 Consumption of sugar in different provinces		(in 1000 tons)
	Production	Consumption
Bengal	29	174
Bombay	55	223
Madras	34	100
Bihar & Orissa	335	70
United Provinces	720	125
Punjab	33	265
Central Provinces	...	43
Assam		17
Sind		25
Rajputana		58
Central India		35
Hyderabad		19
Mysore		10
Kath		3

2 Report of the Tariff Board on the Sugar Industry, 1938, p.23.

incidentally reduces the cost per unit of overhead charges. Bengal also has this supply, and the sugar refined from this gur is free from excise duty. The introduction of prohibition of alcoholic drinks in several provinces gave an impetus to the manufacture of gur from unfermented liquors and this may have some influence on trends of location in future when this programme comes into full force. Apart from these natural advantages and economic factors, public opinion has of late (specially after the inauguration of provincial autonomy) been favouring greater self-sufficiency in the requirements of each province. Thus though immediately after the grant of protection in 1932 the industry was concentrated in the United Provinces and Bihar, several factors had been operating to disperse the industry wider.

A change in the territorial distribution of production is bound to have serious repercussions on the present exporting areas, namely, the United Provinces and Bihar. This possibility attracted the attention of the industrialists and the Governments of these two provinces so far back as 1935 when in the Sugar Conference they pleaded for a reduction in the railway freight on sugar to distant parts of the country. This was naturally resisted by the representatives of those provinces who wanted to develop their industry with the help of this indirect protection also. The subsequent developments have substantiated the fears of the representatives of these provinces.¹ Out of 27 factories established between 1935 and 1938, 8 were in the United Provinces, 1 in Bihar and the rest 18 were in other provinces. In order to check undesirable growth and congestion in the United Provinces and Bihar, the provincial Governments introduced a scheme for licensing new factories. The Sugar Tariff Board of 1938 drew the attention of the Government and people to the need for rationalisation of the industry under some form of State control, and for this purpose suggested the convening of an all-India conference representing all interests. Though the future prospects of the two provinces seem to be gloomy, it is necessary to take notice of the following facts without rushing to hasty conclusions. It will be noticed that the mills of southern and western India can at best supply the needs of those regions and from the previous table we notice that it is only a quarter of the total consumption. The supplies of the United Provinces and Bihar to South India are about a

1. New factories established.

	1935-36	1936-37	1937-38	1938-39	Total
United Provinces	1	2	2	3	8
Bihar	.	1	.	...	1
Madras	...	2	...	2	4
Bombay	...	...	...	1	1
Bengal	...	..	2	3	5
Punjab	..	1	...	...	1
Orissa	...	...	1	..	1
States	1	..	4	..	5
Assam	...	...	...	1	1
	<hr/> 2	<hr/> 6	<hr/> 9	<hr/> 10	<hr/> 27

quarter of their total surplus. All these supplies cannot be eliminated by increased local production because the factories of those provinces which gained more experience can work with greater efficiency and bring down costs of production. In addition where there are a large number of factories, the available quantity of by-products like molasses and bagasse, etc., will be large enough to put to some economic use and if some return can be got for them, this will help to bring down the cost of production of sugar. Already the Governments of the United Provinces and Bihar have introduced legislation to encourage the production of power alcohol from molasses, and if their attempts at getting this mixed with petrol succeed, and in addition if researches in the uses of molasses as cattle feed, manures, road surface materials also succeed, these areas will be in a good position to maintain their place. Further, the industrialists can try to find increased uses for sugar by way of manufacture of syrups, confectioneries, and canning and preservation of fruits, etc. Hence though other centres also may develop and the relative position of these provinces may come down, it will be possible for them to maintain their present production.

Apart from this problem of inter-provincial location, this industry has additional problems relating to the distribution of factories in the same region. If there is a congestion of factories in any region, there will be competition for crop in the same area leading to undesirable results. Where factories are few and far between as in Madras, Bombay, Bengal and the Punjab, this problem does not arise. But in the United Provinces and Bihar, the necessity for a system of zoning for factories was felt. Of course there are obvious advantages and disadvantages in this system. Among the former we may mention (1) the contact between the factory owners and agriculturists which may regulate the demand for the total quantity of cane and its time of supply to the material advantage of both parties. (2) Also by this personal contact, the agriculturists can obtain advances for their crop to enable them to raise increased quantities of improved varieties of cane by spending money on manure and seeds. (3) It will also encourage the creation of better facilities for transport of cane from field to factory, reducing loss to both parties. The principal disadvantage of this system of zoning is the fear that a monopoly may be created for each factory, whose management may exploit the weaker ryot and also deny encouragement for special qualities by paying uniform rates. But the experience in parts of Madras and in all factories in Bombay may allay this fear, and this evil can be checked by fixing minimum price for the cane and premium for special qualities. The Tariff Board of 1938 reported that the matter was under the active consideration of the two provincial Governments concerned and if necessary action is taken, it is bound to have beneficial results to both the parties.

IRON AND STEEL INDUSTRY

The following table gives the percentage of workers in the different regions to the total workers in the iron and steel industry during the years mentioned.

Region	1925	1931	1935	1937
Bihar	83.6	64.5	67.0	53.2
Bengal	15.7	21.5	27.1	40.1
Madras	...	...	...	1.0
United Provinces	...	...	0.3	0.2
Mysore	0.7	14.0	5.6	5.5

From the above table we find that it is a highly localised industry concentrated mainly in the provinces of Bengal and Bihar. During the period under consideration Bihar gradually lost its position mainly to Bengal, and to a certain extent to Mysore. The United Provinces and Madras were just entering into the industry and their shares were relatively small.

The chief factors that influence the location of this industry are the existence of (1) iron ore and fluxing materials and (2) power resources in the form of coal. In addition, the industry should have good financial support and a wide market because it should be conducted on a very large scale to be successful. In all parts of the world the iron industry is located either near the coal fields which have good transport facilities for iron ore or vice versa and India is no exception for obvious reasons. Large deposits of the ore exist in many parts of the country. But at present by far the most important are those which lie in the so-called "iron belt" extending over the district of Singhbhum in Bihar and the adjoining feudatory States of Orissa. The belt contains quantities of large rich iron ore in which the proportion of metallic iron frequently rises over 60%.¹ The iron industry of India was first established on the coal fields of Bengal which could obtain ore cheaply from the adjoining fields which had ore near the surface. But extensive exploratory work was done by Sir J. J. Tata before the Tata Iron and Steel Works was located in the place now called Jamshedpur which has unique transport facilities for bringing rich iron ore and best quality coal. This is responsible for making the pig iron produced there cheapest in the whole world. Whereas a large part of the pig iron produced there is converted into steel goods in or in the neighbourhood of this factory, most of the pig iron produced in Bengal is exported to foreign countries. Hence though the factories of Bengal have to pay transport charges for carrying ore from a distance to the coal fields, they enjoy favourable conditions for exporting the finished goods and also in having the managing agency close by. The Mysore factory was established to exploit the neighbouring markets of Southern India, but due to several adverse conditions in technical factors it was a losing concern till recently. So far the industry has been concentrated in the "iron belt" of Northern India. "Gwalior presents immense possibilities and in time to come may stand as a formidable rival to Bengal and Bihar."² High grade ore, limestone and manganese are available in the neighbourhood in large quantities. The only drawback is the great distance of the coal fields. This will partly be compensated by nearness of the market. Though there are extensive deposits in the Central Provinces and some valuable deposits in Southern

1. Report of the Tariff Board on Steel Industry, 1924, p. 11.

2. "Capital" *Indian Industries*, Trade and Transport Supplement, 1935, p. 58.

India, the scope for wider dispersion seems to be limited at least in the near future. Their main handicap is the lower content of iron in the ore. Though the Central Provinces have coal, its ash content is great and so it is not useful for the manufacture of coke. Southern India does not possess coal fields close to the ore deposits, and the industry can be developed only if hydro-electric power can be supplied cheaply. Further, electric power can be substituted only for a part of the coal requirements, and for use as a reducing agent, a continuous and cheap supply of either coke or charcoal must be found. In addition, this is one of the industries which have to be conducted on a very large scale and another big factory may not very easily find markets for its products. In fact, with the amalgamation of the Bengal Iron Works and the Indian Iron and Steel Works of Bengal into a new company which made arrangements to commence manufacture of steel from 1940, the capacity of the existing steel concerns in India has come to a high figure of over a million tons. So to ensure the success of any more concerns, wider markets have to be found for iron and steel goods in higher engineering industries like machinery, ship-building, automobiles, etc., in all of which India is lagging behind advanced industrial countries. If these and other industries for military purposes like manufacture of ammunition, etc., are established in India, there will be greater demand for indigenous production of iron and steel goods and greater scope for expansion of the industry in the other regions. In some of these industries port cities like Calcutta will be at an advantage because of the availability of docks for ship-building.

Another direction in which great strides have been made in other parts of the globe and slight tendencies are noticeable even in this country, is the use of scrap iron in furnaces. In some countries scrap iron is replacing pig iron itself. It has been observed that "As far as is due to changes in demand, the decline of Scotland which has occurred mainly in the pig iron branch is due in part to the depression in foundry and ship-building trades, but chiefly to the use of scrap in steel furnaces."¹ In India, the scrap is used in a few re-rolling mills in the United Provinces and Madras and a good quantity is exported to foreign countries. But this branch of the industry is not likely to attain great dimensions here, because the quantity of scrap available in different regions of the country is small due to the backwardness in heavy industries and the poverty of the people. Where some quantities are available, small factories may be set up. But their weakness was revealed in the conference called by the Government of India on the representation of the small concerns about the unfair competition by Tatas.

Thus on all accounts we find that this industry is likely to continue to be localised in Bengal and Bihar for a long time to come. But when the rich ores of Bihar are exhausted or when the demand for steel increases by the development of higher engineering and munition industries, the Central Provinces, Gwalior and Madras may have good chances of developing the industry.

1. G. C. Allen, *British Industries and Their Organisation*, p. 112.

In England the "location of the industry had been repeatedly and vitally affected by the discovery, from time to time, of new processes of production."¹ "Before the eighteenth century charcoal was used for smelting the ore and so the foundries were established in regions abundantly supplied with ore and timber. But discoveries of the use of coal in smelting, in the first quarter of the nineteenth century, transferred the industry to districts abounding in ore and coal. But the fuel economies achieved during this century reduced the quantity of coke required to smelt the iron ore, and the industry came to be developed even in regions having ore of a low content of iron. It will thereby be seen that the cost of transport has played an outstanding part in determining the location, and changes in the location of the iron and steel industries—partly the relative costs of transporting the coal to the ore and the ore to the coal, and partly the cost of distributing the product, the other influencing the type of product produced in a given district. But it should be observed that the method of charging, e.g., railway classification at low ton-mile-rate, and tapering system of charging a lower rate over long distances—has tended to reduce the cost of transport as a location factor. Nevertheless in the smelting and refining of materials and the production of semi-manufacturing products, coal is a raw material and a source of power, so that the pull of the coal producing areas, in combination with the areas producing other minerals, is irresistible."²

That the market also exercised an important influence is shown by the line of specialisation followed by the iron and steel industry in different parts of the country, (Great Britain). "The coastal regions specialised upon steel, produced either directly for export or as material for ship-building or for industries producing finished goods for export. In the Sheffield area the industry concentrated upon special classes of steel needed not only in the cutlery trade, but also in ammunition work and other classes of work in which the cost of transport of the final product was not a major consideration."³

PAPER INDUSTRY

The following table gives the shares of different regions in the number of people employed in the industry—

	1925	1931	1935	1937
Bengal	77.6	73.7	72.5	64.2
United Provinces	14.6	12.4	14.1	12.3
Bombay	6.0	11.0	12.2	11.8
Madras	...	2.1	...	1.6
Madras States	1.8	0.8	1.2	1.6
Punjab	...	...	...	8.5

1. G. C. Allen, *British Industries and Their Organisation*, p. 80.

2. *Royal Commission Report*, p. 254.

3. *Ibid.*, p. 31, para 71.

This shows that this is a highly localised industry mainly concentrated in Bengal, with the United Provinces and Bombay following in order. Out of the 12 mills manufacturing paper in 1937, 3 were in Bengal, 2 in the United Provinces, 4 in Bombay, 1 in the Punjab, 1 in Madras and 1 in Travancore State. But the mills in Bengal are the biggest, and cover nearly three-fourths of the total production of the country. Though the Punjab and Madras mills were established a long time back, they were closed for long periods due to different reasons.

The main requirements for starting a paper mill are (1) raw materials and auxiliary materials, (2) power, (3) pure water in sufficient quantities and (4) market. Up to the thirties of this century "sabai" grass was the chief raw material and it was available in large quantities only in the United Provinces, Bihar and the Punjab. Auxiliary materials consist of chemicals required for the manufacture of pulp from raw materials, or for bleaching the pulp, and for the conversion of pulp into paper, the last variety consisting of loading and sizing materials. In the beginning almost all these had to be imported from abroad; but now a good proportion of them are manufactured in Bengal. Coal was the chief source of power and it was available only in Bengal and Bihar. It is not surprising that the industrialists of Bengal found the banks of the river Hooghly an ideal place to start the industry as it was favourably situated with respect to all factors except market. Though sabai grass had to be carried over long distances from the United Provinces, it was found "that there can be little or no economy if the freight on 2½ tons of grass for 900 miles is saved at the cost of paying freight on 5 tons of coal for a distance not much shorter."¹ Want of raw materials and power resources were the chief handicaps in developing the industry in other centres near the markets.

But the tariff protection of 1931 brought about important developments in the last decade with the successful use of bamboo as the raw material for making pulp and with the development of hydro-electric schemes in some provinces and States which were formerly handicapped for want of power resources. This change in raw materials and power resources is responsible for the dispersion of the industry to distant centres which are favourably situated with respect to these factors, and the high costs of transport from Bengal weakened her position in these markets. All the four mills established in 1938 were outside Bengal, viz., one in the United Provinces, one in Bihar, one in Orissa, and one in Mysore. By the end of 1938 a new company was floated in Hyderabad to take advantage of the bamboo forests and the coal resources in the State. There was a proposal to start a mill in South Madras using "eta" reed and hydro-electric power.

So far, India has been producing only the ordinary kinds of writing paper, and she depends entirely on foreign imports for newsprint which is made chiefly from mechanical and chemical pulp. Though forests of coniferous trees—pine, spruce and fir—exist in the Himalayas, the great difficulty of extraction and the lack of transport facilities have hitherto stood in the way of utilisation of this wood for the manufacture of chemical pulp.

1. Tariff Board Report on Paper Industry, 1925, p. 67.

But there was a proposal for the erection of a mill using pine and silver fir wood from the Kashmir State, a new development which may prove to be of considerable importance. The possibilities of the manufacture of pulp from the pine are more promising, though the quantity available in accessible areas is confined to the United Provinces. Another important line for development is afforded by the existence of large quantities of bagasse in the sugar industry of the United Provinces and Bihar. In the United States of America it is largely used in the manufacture of boards and wrapping paper, and in the United Kingdom also encouragement is given to this industry by putting this commodity on the free import list. The chances for the development of this industry are worth investigation.

All the above facts tend to show that the trend is for the dispersion of the industry to some other parts of the country also.

CEMENT INDUSTRY

The following table gives the percentage of workers employed in the cement industry in the different regions:—

	1925	1931	1935	1937
Central Provinces	35.8	21.3	33.6	31.8
Punjab	15.2	9.6	9.2	13.0
Bihar	9.7	10.9	10.4	16.9
Madras	..	.	3.6	2.3
Rajputana	28.0	28.8	20.4	17.8
Hyderabad	...	13.6	10.4	9.2
Baroda	...	5.6	5.0	3.6
Bombay States	11.3	10.2	7.8	5.4

Out of the 12 factories working in India, 4 are situated in the Central Provinces, 2 in Bihar, 1 in the Punjab, 1 in Rajputana, 2 in the Bombay States, 1 in Madras, and 1 in Hyderabad. The table shows that the industry is more widely dispersed than all other industries.

The chief factors that influence the location of this industry are (1) raw materials, (2) power resources and (3) market. The raw materials consist of limestone or chalk, clay and gypsum. Limestone of excellent quality exists in abundance in many parts of the country and close to railway lines also, so that it has usually been possible to establish the factories in the immediate vicinity of the quarries.¹ Suitable clay also is available in sufficient quantities near the quarries. Gypsum is the only raw material which has to be carried from a distance. But in respect of fuel the industry is at a great disadvantage because coal of superior quality is available only in Bihar and Bengal. Though coal is available in the Central Provinces also, the special quality used in the kilns which should contain the minimum amount of ash, has to be brought from the above two provinces. This was partly responsible for the higher costs of production.

1. Report of the Tariff Board on Cement, 1925, p. 4

of cement in this country. With the recent developments in hydro-electricity this problem is partly solved. With regard to markets also, the industry had not been favourably situated. In the earlier years, port cities were the largest consumers of cement, but the factories started at that time were situated in the interior because they could not stand the competition with the foreign imports in and near the ports. They were therefore catering only to the internal markets which afforded indirect protection due to transport costs. But when the Government raised protective tariffs to enable them to compete even in the ports, new factories were not started in and near these places, and the existing factories extended their production for the expanding market. All the factories were formerly situated in central and northern India, far from the South Indian market. To make good this deficiency, in the early thirties of the century one factory was started in Hyderabad and a few others in the Madras province.

In 1936, the then existing companies amalgamated into the Associated Cement Company with the primary object of bringing about economies in costs of production and thereby reducing prices to stimulate the demand for the commodity. They expected to do this by (1) utilising to the fullest advantage the output of all factories in their most economic markets, (2) regulation of production throughout the country in direct relation to demand for the purpose of effecting economies in working and distribution cost per ton, (3) improvement of the industry by the development of production in suitable localities and (4) control of production in unsuitable areas. This shows that the company recognised the defects of the location of the industry with respect to markets and it planned to start new factories, one in central Punjab, one in Sind and another in Madras. Meanwhile a rival company, the Dalmia Cement Company, began to exploit this weakness by starting one factory in the Punjab, one in Sind near Karachi and another south of Madras in Trichinopoly. Thus we find that with the development of electric power, the market is having a greater influence on the location of the industry which is becoming more widely dispersed. One important fact to be noticed in this connection is that, thanks to the propaganda of the Concrete Association of India, the consumption of cement in the up-country markets has far outstripped that of the ports, and this is not confined to any part of India, so that it encourages the wider distribution of the industry.

COAL INDUSTRY

The following table gives the percentage of works in the coal industry in the different regions:—

	1925	1933	1935	1937
Bihar	60.5	57.9	51.7	53.2
Bengal	22.8	25.8	27.9	26.2
Central Provinces	4.8	5.0	7.3	6.1
Punjab	0.8	0.6	1.0	1.2
Assam	2.2	2.1	1.0	1.1

	1925	1933	1935	1937
Hyderabad	6.7	6.1	6.1	6.3
Central India States	1.5	1.1	1.4	1.3
Bihar	0.2	1.1	1.4	4.3
C. P.	0.5	0.3	2.2	

This shows that it is a highly localised industry mainly concentrated in the two provinces of Bihar (including States) and Bengal. The other areas of some importance are Hyderabad and the Central Provinces. This industry depends on the existence of coal seams in the earth. All the best coal deposits in India are concentrated in the small region comprising of the western part of Bengal and the neighbouring eastern part of Bihar and Orissa. Naturally the important collieries are centred there and more than 90% of the coal raised in India every year comes from the chief coal fields of Raniganj, Jharia and Bokara of that region. It was estimated by Dr. Fox of the Geological Survey of India that out of a total coal reserve of nearly 54,000 million tons, about 52,359 million tons are in the deposits of these regions.¹ It is not only in quantity but also in quality that the other parts are at a disadvantage. All classes of coal are available in that region whereas other parts have only second class coal. This high concentration of power resources had been the chief handicap for the development of large-scale industries in the other parts of the country. But of late, this is partly remedied by the development of hydro-electric power in the south-west, north and north-western parts of the country. But still there are some industries, like iron and steel, cement, etc., for which coal is a necessary ingredient.

3. SUMMARY

From the above survey, we find that almost all the large-scale industries are localised, the degree of localisation varying with the different industries. If the basis for assigning an industry to a particular region is taken as one half of the total number of employees in the industry, we can say that cotton industry is localised in Bombay, jute and paper in Bengal, sugar in the United Provinces, and iron and steel, and coal in Bihar. No industry is localised in Madras, the Punjab and the Central Provinces. Cement industry is not localised in any area. But these rough generalisations are sometimes liable to be misleading and a better understanding of the important centres for an industry can be had only from the distribution of location factors for each industry. The following table gives the frequency distribution of these factors for the year 1937 with the class interval 0.5. As the population engaged on large-scale industries is less than 1% of the total population of the country, the co-efficients of location are calculated with respect to both the industrial as well as total population of the country.

1. Report of the Tariff Board on Steel Industry, 1924, p. 96.

TABLE I (A)—LOCATION FACTORS WITH REFERENCE TO INDUSTRIAL POPULATION

Co-efficient.	Cotton.	Jute.	Sugar.	Iron & Steel.	Coal.	Cement.	Paper.
0	1	13	6	13	10	10	12
0.01-0.50	5	3	7	2	3	1	3
0.50-1.00	3	...	2	...	1	...	...
1.00-1.50	4	...	1	1	...	...	...
1.50-2.00	...	...	...	...	1	..	1
2.00-2.50	5	1	...	...	1	1	2
2.50-3.00	...	...	...	..	...	...	...
Above 3.00	...	1	2	2	2	6	...

TABLE I (B)—LOCATION FACTORS WITH REFERENCE TO TOTAL POPULATION

Co-efficient.	Cotton.	Jute.	Sugar.	Iron & Steel.	Coal.	Cement.	Paper.
0		13		15	10	10	12
0.01-0.50		3		2	2	1	1
0.50-1.00					1		2
1.00-1.50					2		1
1.50-2.00					1		1
2.00-2.50							
2.50-3.00							
Above 3.00			1				1

These tables show that jute, iron and steel, paper, coal and cement are confined only to a few regions. Cotton industry is found in almost all regions and next comes sugar. But in a large number of regions the latter industry is of very little importance. The distribution with reference to industrial population is different from the distribution with reference to the total population because the industrial population itself is dispersed unevenly as can be seen from the following table:—

PERCENTAGE DISTRIBUTION OF PEOPLE EMPLOYED IN LARGE-SCALE INDUSTRIES

Region	1925	1931	1935	1937
Bengal	34.3	31.4	29.0	28.8
Bombay	21.3	21.4	21.6	21.5
Madras	7.0	7.9	8.3	8.6

Region	1925	1931	1935	1937
United Provinces	4.6	5.5	7.2	7.2
Bihar and Orissa	10.2	9.9	9.2	9.3
Central Provinces	3.1	4.4	3.7	3.4
Punjab	3.1	2.6	2.9	3.3
All States	9.5	12.4	13.6	13.9

From the above table we find that in 1925, out of the total industrial population, about a third was in Bengal and a fifth in Bombay. Bengal has continued to occupy the first place, though its share has been steadily coming down. Bombay is maintaining its second place as well as its share. As regards other provinces, the United Provinces showed the greatest increase in share followed by Madras. The share of all States put together increased by nearly 50%,—from a little less than 10% to over 14%—during the decade.

The following table gives the co-efficients of localisation of the different industries in different years calculated according to the two methods mentioned in the introduction:—

	1st Method (graphical)		2nd Method (numerical)		
	1925	1937	1925	1931	1937
Cotton	0.793	0.722	0.640	0.608	0.540
Jute	0.842	0.828	0.836	0.822	0.793
Sugar	0.609	0.625	0.535	0.561	0.549
Iron and Steel	0.842	0.770	0.729	0.722	0.710
Coal	0.763	0.731	0.525	0.586	0.564
Cement	0.848	0.763	0.723	0.669	0.644
Paper	0.762	0.713	0.625	0.634	0.570

One important point that will be noticed is that in all cases the graphical method gave a higher figure than the numerical method. This is due to the fact that the number of regions is very small and the distribution is not continuous. Hence the results got from the smooth graph naturally give a higher figure. But both the methods lead to the same conclusions. In all industries there is a downward trend in the coefficient of localisation, the rate of fall being different for the different industries. The causes therefor have already been explained under individual industries. In 1937 the coefficient is highest for jute and in order follow iron and steel, cement, paper, coal, sugar and cotton. Thus the two textiles peculiarly occupy the opposite ends of the scale. The coefficient of localisation for all industries put together is much smaller than that for any individual industry. This is due to the fact that different industries are localised in different regions, and so the total industrial population is naturally more evenly distributed over the whole area. We notice a tendency of wider dispersal of industrial population in the gradual reduction of the coefficient of localisation with time.

"The position of most large-scale industries (in India) has been determined primarily by transport facilities, i.e., they are situated at either the

great ports or railway junctions. The second determining factor has been proximity to raw material, for instance in the case of jute and cotton industries. Proximity to a source of industrial power has so far been only a secondary consideration."¹ We find that the industries are concentrated chiefly in the great ports of Bombay, Calcutta and Madras, of which the last is the least important. To these were later added, other important urban areas like Ahmedabad, Sholapur, Cawnpore, Madura, Coimbatore, etc. But still later, we find certain cities growing round industrial centres created by the large-scale planning with vision and foresight of entrepreneurs, the chief examples being Jamshedpur or Tatanagar and Dalmianagar in Bihar.

The earlier concentration of industries in Bombay and Calcutta was due to several important factors. The industrial importance of these cities is generally attributed to historical factors, but as there were powerful economic causes behind the growth of these towns, the concentration of activity therein can by no means be called irrational or fortuitous. The two cities—Calcutta and Bombay—are the seats of the important managing agents in this country who influenced the promotion and working of large-scale industries. Naturally their presence influenced the location of industrial establishments in those places. Another important point to be noted is, that Calcutta and Bombay are the chief ports in India, having a big share of the total foreign trade. Naturally they are the great distributing centres for the inland trade, and have excellent transport facilities to different parts of the country. The policy of the railways in the earlier years was to offer cheap freights over long distances, and this helped the industries which were started there. Calcutta enjoyed some special advantages over Bombay in that it was very near the coal fields, and had cheap water transport to the inland centres. Moreover, while the managing agents of Bombay were chiefly interested in one industry, namely, cotton textiles, the managing agents of Calcutta exercised influence over a number of industries, viz., jute, coal, tea, etc. This led to the concentration of many subsidiary industries also there. But of late capital and business ability have become more abundant in inland centres, and their favourable transport relations with consuming areas by road and also the change in the railway policy of charging according to distance, enabled them to compete with the older centres. When a wide field was opened for industrial expansion by the adoption of the policy of discriminating protection by the Government, the inland centres were greatly benefitted.

The following table shows the rate of development in different regions by giving the total number of people employed in all large industrial establishments in different regions in 1937, as a percentage of those in 1925 :—

British India	1937 (1925 = 100)	States	1937 (1925 = 100)
Madras	150	Hyderabad	171
Bombay	124	Mysore	194
Bengal	104	Central India States	174

1. Dr. Anstey. *Economic Development of India*, 1936, p. 37.

British India	1937 (1925 = 100)	States	1937 (1925 = 100)
United Provinces	194	Madras States	222
Central Provinces	81	Bombay States	297
Punjab	129	Baroda	186
Bihar	105	Rajputana	160
		French Indian States	111

We find that the rate of progress in States was much greater than that in British Indian provinces and also in the latter, the United Provinces showed the highest rate of progress followed by Madras, the Punjab and Bombay in order. Bengal and Bihar registered only slight increases and the Central Provinces was the only region in which there was a fall in the industrial workers between the two periods. These differential rates of increase were partly due to the varying rates of increase in the different industries, which were localised in different areas. The following table shows the progress made by the different industries during the period under consideration:—

Industry	1931 (1925 = 100)	1937 (1925 = 100)
Cotton	111	152
Jute	81	90
Sugar	128	584
Iron and Steel	84	113
Paper	119	168
Cement	121	227
Coal	92	103

Sugar recorded the largest increase and the United Provinces where this industry is localised, naturally takes the highest place in the list. Next in order come cement, paper and cotton. Iron and steel recorded only a slight increase, and jute is unique in showing a fall. It will be noted that the industries which recorded only a small increase or a fall are those which were affected by the economic depression as can be seen from the index numbers of 1931.

The shifts in location can be explained by the following facts. The high degree of concentration of industries in Bombay and Calcutta brought in its train, higher local rates, taxes, rents and also major labour problems. These led to higher costs of production in these centres, and weakened their competitive power against new centres. All these tended to a greater dispersal of the industrial population. The gradual fall of the share of Bengal is due to two important causes: (1) the industries in which she is chiefly interested, namely, jute and coal, developed very well even before the period under consideration and there was little scope for further expansion, and (2) they did not receive any stimulus by protection during the period. On the other hand, the fall in foreign demand for jute during the great depression led to retrenchment of labour in that industry. Bengal is not very advantageously situated for the new industries. These factors

were responsible for the decline of Bengal. The fall in the Central Provinces can be explained by the decline of cotton industry and the failure of any other industry to develop there. As regards Bombay and other centres, they took full advantage of the protection and expanded their industries. Though Bombay city recorded a fall, a good part of its share was taken by Ahmedabad which is also in the Bombay Presidency and hence in the aggregate we do not notice any fall in her share. The States are in a better position to develop the industries, because their ample financial resources and their less stringent labour legislations increase their competitive power. But excepting in a few States like Hyderabad, Mysore and Baroda, their rulers have not, for a long time, taken sufficient interest in the development of industries. But by their contact with British India, where rapid progress has been going on, an impetus is given to the industries in the States and the rate of progress is apparently high in the early stages. With the advent of democratic form of government in States we may look forward to a greater expansion of industries therein. Another important cause for the tardiness in the development of industries in some provinces and States is the excessive concentration of coal in a compact region comprising of Bengal, Bihar and the Central Provinces. Lack of power resources and high transport charges for carrying coal over long distances retarded the progress in the other regions. Bombay being a port city could import coal cheaply from foreign countries. But with the increasing development of hydro-electricity in the Punjab, Madras and the United Provinces a fillip is given to industrial development in those regions.

The main points that emerge from the above analysis are that in the beginning, the existence of capital and good transport facilities attracted industries to Bombay and Calcutta; and this impetus of the earlier years continued for a long time. But with the spread of managing ability, and the flow of capital into industries in different regions, nearness to raw materials and markets is having a greater pull. This is a feature common to all countries of the world. Even now there are some industries like iron and steel which, by the requirements of their size, the importance of raw materials and power resources, are tied up to particular localities.

The location of the industries has so far been to a great extent determined by the individual judgment of entrepreneurs. When their calculations, if any, proved correct, the concerns succeeded; if not they failed. No systematic attempts were made to investigate and weigh the relative merits of different regions for different industries. As long as there was sufficient scope for new enterprises, the evils of this system were not felt. But, as has already been pointed, of late several factors have been operating to break the former concentration of industrial population. These are accentuated by the fact that the country is a very big one, with a large number of provincial and linguistic groups, and a tendency for local patriotism and local self-sufficiency has been gaining ground. Specially since the advent of provincial autonomy, each provincial Government is anxious to show its achievements in industrial fields. Hence while new centres are rapidly progressing, in many industries, production exceeded the demand under normal conditions. This happened in sugar, cement,

cotton piecegoods, etc. In the Sugar Conference of 1935, the representatives of the United Provinces and Bihar made a case for checking the establishments of new factories and reducing the railway freights for distant markets in southern and western India so that the surplus sugar of these provinces could be easily marketed. On the other hand representatives from the latter provinces opposed those two moves, the first on the ground that they were lagging behind in the development of the industry and should be given an opportunity to have their share of it, and the second on the ground that for their own progress they require some protection from internal competition. Later, the sugar mills formed a marketing association to control the prices. To check overproduction in cement, a cement marketing board was established and in 1936 the then existing concerns were amalgamated into a central body. The overproduction of cotton piecegoods and the heavy fall in their prices in 1939 led to talks for the curtailment of production in this industry also. In the iron and steel industry, so far Tata's is the chief concern and so it has been able to carry on without any difficulty. In fact, the small re-rolling mills complained before the Tariff Board in 1934 that Tatas were trying to push them out of the trade by charging highly for steel billets. A conference was held after representation to the Government of India and at their invitation, to consider the situation of overproduction and internal competition in that industry. Unfortunately it ended without any definite results. In the jute industry, though there is no competition from other regions, the number of mills in Bengal has been increasing, and the production has exceeded the foreign demand. For some time there was a voluntary restriction of production, but with the rise of non-association mills outside the scheme, this restriction was given up resulting in heavy overproduction. Later another agreement was reached to curtail production. In match and paper industries also the same complaint of overproduction was heard. Hence a stage had come when the Government and people should make efforts to see that there was no undue expansion anywhere and that the new mills were located in proper places. This can be done by making it obligatory to obtain licenses for opening new factories. Investigations have to be carried out to define zones for different industries and to issue only the requisite number of licenses in each zone. If sufficient care is not taken there is bound to be a great loss to the investors, which will retard the future growth of industries. Also the derelict works of declined regions will bring out the same problems as were experienced in the depressed regions of England and other countries.

There is another aspect of the question to be considered. Each region should possess a nice balance of different industries, without being dependent on a single industry. This has effects both on the economic and social sides. On the social side, the industries in a particular region mould the general character of the people in the region and also determine their standard of living. Dependence of all people on a single industry narrows their outlook and gives very little scope for the development of all faculties and these evils will be carried through generations. There will be very little scope for choice of suitable jobs for the young people. If in

addition owing to industrial vicissitudes, unemployment increases, its evil effects depress the standard of living and life of the whole population. On the economic side, "diversification of industrial activity means less violent depressions and less excited booms since the various industries will not all move in exact accord."¹ On the economic side the principal results of trade depressions are, unemployment and the consequent misery to labour population.

The following table gives the percentage of persons employed in each industry to the total employed in all industries in 1935 in each province:—

	Madras.	Bengal.	Bombay.	U.P.	Punjab.	C.P.	Bihar & Orissa.	Total
Cotton	34.8	5.0	66.8	27.5	4.3	29.7	0.6	26.4
Jute	4.2	47.0	..	2.3	...	...	2.6	16.7
Sugar	2.1	0.6	0.4	30.3	4.0	...	9.2	4.1
Iron & Steel	..	1.7	...	...	..	...	13.0	2.0
Paper	...	0.7	0.2	0.7	...	...	...	0.4
Cement	0.2	...	..	...	1.1	3.2	0.2	0.4
Coal	...	8.9	...	...	...	16.8	51.8	9.5
Total	41.	44.	67	61	9	50	77	60

This table shows that the proportion of the workers employed in the large-scale industries under consideration to the total of all industrial establishments is about 60% for the whole of India, and this proportion varies from about 80% in Bihar to less than 10% in the Punjab. The two textile industries, cotton and jute, are the most important, and coal, sugar, iron and steel follow in order. Paper and cement each employ less than 1% of the total industrial population. Bengal, the United Provinces and Bihar take a share in a good number of industries. Bombay is entirely dependent on cotton industry. Madras has cotton, jute and sugar, and the Central Provinces possess cotton, cement and coal industries. This shows the great defects of Bombay's industrial progress in that its prosperity is dependent entirely on a single industry. The disabilities on this account were revealed in the enormous distress to the industrial population during the great strikes of the twenties of this century. There is a great need to develop other industries in that area, as well as in the Central Provinces and Madras. The Punjab is backward in all large-scale industries, and with its potentialities in raw materials, hydro-electric power and other factors, there is great scope for its future development.

The concentration of industries in a few regions brings with it labour problems of housing, transport facilities to factories, amenities for recreation, etc., and sometimes major labour troubles in the form of strikes and lockouts. The rapid expansion of cotton and jute industries in Bombay and Calcutta respectively in the early decades created congestion and slums to the detriment of the health of the labour population. Trade unionism is

still in its infancy in India, and the conditions of labour are abominable. Though here and there a few industrialists are taking some interest in labour welfare, the general conditions of the life and wages of workers are very low. So in their interests and in the interests of the whole country, the Government and public should see that there is no lopsided development in any area, and that industry develops in places which are most suitable in the interests of the whole community.

Great interest is being taken in advanced industrial countries like England and America in studying the problems connected with the location of industries. Similar efforts should be made in India and we should gain by the experience of other countries. The responsibility rests heavily on the Government and the industrialists. Because most of these industries are growing under the shelter of tariff protection, the public should receive full benefits for the burden they are bearing.

It is doubtful whether the industrialists are investigating the possibilities of different regions before making the final selection. It is true that the profit incentive should lead them to the most suitable site for their factories. But the simple fact of earning or not earning profits is not a valid proof of the correctness of selection when competition is imperfect and quotas, price agreements, division of markets, etc., are prevailing among the producers. Even granting that profits are a real index of proper location, the immediate profits must be balanced against the long term interests of the community. The huge economic wastes that have been left to the present generation in western countries, by the wrong decisions of the industrialists of the previous generations should open our eyes to the necessity of long term planning in the interests of the industrialists, and present and future generations.

It should however be recognised that the local authorities and the State have their own part to play in influencing the choice of the industrialists—the former by their decisions in providing public utilities, and fixing the rates and taxes, etc., and the latter by its policies in regard to tariffs, subsidies, trade pacts, etc., and development of transport facilities. The State can also focus the attention of industrialists to the advantages of particular regions by gathering the necessary information and giving publicity to it. The development of Air Force has brought the necessity to locate industry with an eye towards the requirements of national security. It is necessary to investigate all the direct and reciprocal effects of these different factors and co-ordinate the different activities of the State so as to give the maximum benefit to all. This requires the assumption of powers by the State to restrict the use of land for industry to certain places by legislation on town planning, factories, etc., and for curbing the activities of the economic pirates interested in immediate profits without regard to future requirements. All these require planning in advance. It is a good augury that efforts are being made to study and tackle some of these problems by a non-official body, the Industrial Planning Committee, created by the Indian National Congress. But the labours of this Committee will not be fruitful unless they are backed by some form of sanctions for enforcement.

Chapter III

SIZE OF INDUSTRIAL UNITS

IN any industry of adequate size, we find units of varying magnitudes.

It is not possible to realise the advantages of large-scale production unless the plant is above a particular size, and certain diseconomies set in if the size exceeds another limit. In between these limits the sizes of different units are distributed, and one often notices the marked tendency of these distributions to cluster round a central value, which may be termed the optimum unit. The size of the optimum unit and the distribution of the other units about this optimum are determined by a number of factors which are classified into four main categories by E. A. G. Robinson.¹ They are (1) technical, (2) market, (3) managerial, and (4) financial. According to Robinson the optimum firm is "that firm which in the existing conditions of technique and organising ability has the lowest average cost of production per unit, when all those costs which must be covered in the long run are included."²

(1) The size of the optimum technical unit will depend upon how long the economies of large-scale production continue. Optimum technical units are large in two different types of industry; (a) in those in which the product or machinery is physically very large, e.g., steel making, ship-building, etc., (b) or those in which the final product is highly complex in that it is built of a great number of small parts, e.g., motor cars, watches, typewriters, etc. On the other hand optimum technical units are small where the product is both small and simple, e.g., cutlery, weaving of standard cloths, baking of bread, etc. In a given state of technical development, we can predict to some extent the probable upper limit of the optimum technical unit in an industry. If other considerations require a larger scale than this optimum, the technical scale of production can be increased by mere multiplication, until it coincides with the scale consistent with those considerations.

(2) A limit to the division of labour, and the growth towards the optimum technical unit of production, is set in many instances by the size of the market, which in its turn depends upon the radius of the circle within which the firm can profitably distribute its goods, and on the density and the purchasing power of the population living in that area.

(3) & (4) Finally the optimum size of the unit depends upon the managing abilities of the organisers of the industry and the financial resources that they can command. Though the distribution of the managing ability may partly determine the distribution of the size, in a country where the same managing agency has control over a number of units, its

1. E. A. G. Robinson, *Structure of Competitive Industry*, 1943 p. 17.

2. *Ibid.*, p. 15.

influence over the size is complex. As regards the influence of finance, if the company is floated on a joint stock basis and is in the hands of an influential managing agency, it can be of a fairly big size. But if it is under private ownership, or is confined to a group of people, or if the managing agents are not influential, this fact sets an upper limit to the size. In view of the great influence of the managing agents in India in the promotion and financing of industries the distribution of the size of mills has, to a great extent, to be explained from the point of view of technical considerations and the market for the products. At the same time the local differences in optimum will, to a larger extent, depend upon the varying abilities and financial resources of the organisers in the different regions.

The determination of the optimum size in any industry is a very difficult matter. But an objective estimate for each industry can be made from the study of the distribution of size in each of the industries. The "Mode" of the distribution may be taken to typify the optimum unit because when the entrepreneurs make their decision about the size of the plant they would install, they would fix upon that one, which according to them will lead to minimum costs of production and consequently maximum profits for their investments. If perchance the decisions of some of them are wrong the forces of competition tend to eliminate the inefficient ones. Of course these may not be effected in the short period competition when economies of capital costs play little part. But in the long run when such establishments wear out they will not be replaced, and entrepreneurs will perpetuate only establishments of that size which prove to give the lowest average costs of production (capital and recurring). Of course this argument assumes the existence of the conditions of perfect competition, namely, (1) that the markets consist of a large number of buyers and sellers so that no one can dominate a large proportion of supply and demand, (2) that the buyers or sellers are quite indifferent to all except the market reactions of their opposite numbers, (3) the factors of production are perfectly mobile and (4) the entrepreneur has a complete knowledge of the alternatives open to him.

The distribution of the units about the optimum can be explained by the following considerations. It was pointed out above that four factors influence the size of the units. If all the four factors have the same optima we should find all the units to be of the same size. But for a particular industry the optima for the individual factors vary and the different methods of reconciling the various pulls bring about different sizes. Thus some firms may be working with maximum efficiency with regard to one or more factors but may be incurring marginal losses with regard to other factors. The different combinations of gains and losses may, however, all lead to the same marginal costs of production. Hence it is the difference in the optima of the various factors that is partly responsible for the variation in sizes. Another explanation for the variation may be found in the problems arising out of dynamic economics. A particular size may be the optimum under the then existing conditions of technique or market conditions or organisation; but with the passing of time, changes may take place in some or all of the factors. Con-

sequently the magnitude of the optimum firm under the new conditions may be different. But only new firms can adopt this optimum and as the capital equipment of the old firms takes time to wear out, at a particular cross section of time, we find the existence of firms of different magnitudes. Another cause for these differences can be found in the degree of concentration of the industry and its age. The greater the concentration of the industry the larger usually is the average size. As regards age, in some industries firms must start at almost the full stature whereas in others they normally start small and grow up to their full stature. Hence if the units are of different ages, the sizes may be of different magnitudes. Finally the fact of the elimination of inefficient units is based upon the assumptions of perfect competition. It is the want of satisfaction of these conditions that sometimes leads to the existence of units of inefficient size by the side of optimum ones.

With this theoretical background we may examine the distribution of the sizes of industrial units in India. This at once brings out the necessity to define an industrial unit, as also the unit of measurement of the size. As regards the former it must be noted that under the same management there may be several units in the same place or different parts of the region, which but for the physical separation of the plant, belong to the same business. On the other hand under the same roof there may be two or more units under different managements. Whether to count each of the former units as independent or all put together as one unit is a tough question to solve. An additional difficulty arises when though the ownership of units is different they are managed by the same agency, so that the management, financial control and market policy for all the units are the same. Here it is proposed to consider any manufacturing concern whose ownership is different and whose accounts are separately maintained, as a separate unit. As regards the unit of measurement of size, the capital or the number of people employed will readily suggest themselves. But they are not proper for the following reasons. The paid-up capital depends upon the method of financing of mills. In centres where industrial credit is abundant and cheap, the management may carry on business with less of owned capital but more of borrowed capital. Otherwise owned capital will be larger. These local differences make comparisons difficult. The number of people employed is unsuitable because the number varies according to the efficiency of employees, the nature of the output and the prevalence or absence of major labour troubles. Hence it is proposed to take the number of spindles and looms for cotton, looms for jute, and capacity for sugar, paper, iron and steel, cement and coal for measuring the size. We may consider these different industries in order.

COTTON INDUSTRY

It has already been pointed out that the chief factors which influence the size of a mill in India are (1) technical factors and (2) market. Unlike in the manufacture of iron and steel, automobiles, etc., the technical optimum size of a cotton mill is comparatively small because there is no operation in cotton textile manufacturing which must be conducted on a large scale from considerations of efficiency only. "The largest-scale of operation in a cotton mill, that of slashing, does not require a plant of more than ten thousand spindles to operate at a high degree of efficiency. The tendency towards the formation of larger plants, so far as production itself is concerned, has been chiefly the outgrowth of attempts to reduce the cost of management and non-manufacturing operations over a larger volume of output. Smaller mills could for practical purposes be considered as equally efficient on technical operations only."¹ In India the supervisory staff and their scale of salaries being lower than in the western countries, the burden of overhead charges on this account is less heavy and hence the saving per unit of output by increasing production is smaller. The Tariff Board of 1932 estimated the cost on this account to be about 8% of the total manufacturing costs;² and taxes, etc., do not represent more than 12½% of the works cost.³ There will be no saving in expenditure on raw cotton which forms nearly 50% of the total cost, as also on stores, labour charges, etc., because expenditure on all these items depends on the size of the mill and actual production. There is no question of saving from bulk purchases and sales because common service performed by the same managing agency to different mills render the size of the individual mills a matter of relatively smaller moment. But in the case of power, the size of the individual plant makes some difference because electric power, which is the main source of power in many mills, is purchased from outside. Larger size tends to reduce cost because the cost per unit decreases with the increase in consumption. On the other hand, if it is produced by the mill itself, as in Ahmedabad, it sets a technical optimum to the size of the mill because over a particular size it will become necessary to extend the power plant and such extensions will not be justified unless a very large increase in the capacity of the mill is contemplated.

Turning our attention to the market, the nature of the products turned out by the mill appears to be one of the chief considerations in determining the economic size of the mill. Where the production is confined to large quantities of standardised goods, a large plant will certainly lead to reduced costs of manufacture. But if it consists of a variety of goods of different qualities, a smaller unit will have decided advantages over a larger one. "It may perhaps be stated that in few countries is the demand for cotton goods so variegated as in India. The existence of marked preferences and tastes of a local or sectional character which has hitherto characterised the Indian market, on the whole, favours the organisation of the small or moderate

1 H E Michel, *The Textile Industries An economic analysis*, p. 93.

2. Report of the Indian Tariff Board on Cotton Industry, 1932, p. 98.

3 Ibid., p. 99

sized mills."1 Even in Japan "in cases where mass production of standard goods is possible, large-scale factories are able to produce at less cost, but where goods of varied patterns are demanded in small quantities, small factories are better situated to adopt themselves to the actual requirements, and can therefore successfully compete with large producers."2

In the following tables, the distributions of the size of the cotton mills, according to the number of spindles and looms, is given for the period 1925 to 1937. This period is very important in the history of the cotton mill industry in India, because upto 1925, it was expanding slowly without any help from the Government and inspite of the excise duty, mainly on the strength of the natural factors favourable to it. But it received the help of the Government for the first time in 1926 by way of abolition of the excise duty. Since 1930 the industry has made tremendous advance, first by the impulse given by the national movement and later with the help of high revenue and protective import duties. Hence a study of the distribution of the size and changes, if any, brought out during the period may reveal interesting facts about the industry. The distributions of the mills in Bombay island and Ahmedabad have been given separately because they are chief centres taken individually, and any local divergences can be brought out. Finally, a mathematical curve is fitted to the distributions of the mills to find out whether they follow any particular law.

FREQUENCY DISTRIBUTION OF NUMBER OF SPINDLES (IN THOUSANDS)

	Bombay.			Ahmedabad.			Rest of India.			All India.		
	1925	1927	1931	1925	1927	1931	1925	1927	1931	1925	1927	1931
Less than 15	4	3	2	5	7	6	33	37	60	42	47	68
15—30	9	9	11	33	36	50	58	66	79	100	111	140
30—45	35	32	22	...	17	15	10	11	22	57	60	59
45—60	17	14	16	3	2	3	10	17	15	27	33	34
60—80	6	9	4	...	3	2	5	5	2	14	17	8
80—100	4	2	6	...	...	...	1	2	3	5	4	9
Above 100	3	1	2	...	...	...	4	4	4	7	5	6
Total	78	70	63	41	65	76	121	142	185	252	277	324

1. Report of the Indian Tariff Board on Cotton Industry, 1932, p. 97

2. *Small Industries of Japan*, p. 95.

FREQUENCY DISTRIBUTION OF LOOMS

	Bombay.			Ahmedabad.			Rest of India.			All India.		
	1925	1927	1931	1925	1927	1931	1925	1927	1931	1925	1927	1931
Less than 200 ...	...	...	...	1	2	1	15	23	28	16	25	29
201—400	1	...	...	15	14	9	36	37	48	52	51	58
401—600	9	11	7	15	24	32	21	32	34	45	67	73
601—800	14	12	16	12	17	16	9	16	14	35	45	46
801—1000	17	17	10	5	7	11	5	8	9	27	32	30
1001—1200	13	13	11	...	...	1	3	4	9	16	17	21
Above 1200	17	18	17	4	4	5	9	10	12	30	32	34
Total.	71	71	61	52	68	75	98	130	155	221	269	291

From the above tables the median and quartile deviations of each of the distributions are calculated.

('000)

	Bombay.	Ahmedabad.	Rest of India.	All India.
SPINDLES				
1925 Median	41	25	22	28
Quartile deviation	11	7	8	12
1931 Median	41	26	20	27
Quartile deviation	11	9	11	11
1937 Median	43	25	21	25
Quartile deviation	12	6	9	11
LOOMS ('00)				
1925 Median	9.4	5.4	3.9	5.9
Quartile deviation	2.4	1.8	1.9	3.0
1931 Median	9.5	5.5	4.3	5.8
Quartile deviation	2.5	1.7	2.1	2.6
1937 Median	9.4	5.8	4.1	5.6
Quartile deviation	2.6	1.7	1.9	2.7

These tables show that the average size of mills in Bombay is highest, next comes Ahmedabad and last other parts of India. Also the dispersion is greatest in Bombay and least in Ahmedabad. From the table of frequency distribution, we find that between 1925 and 1937 whereas Ahmedabad and other centres increased their mills by nearly 50%, Bombay actually lost 10% of the mills. This resulted in a fall in the average size of all mills in India, though there is an increase of the average in Bombay. Whereas the increase in number of mills is spread throughout the period in Ahmedabad, it is greatest in the second period in other parts of India. Though most of the mills of the up-country centres are small units of less than 30 thousand spindles, there are some centres which possess mills of very big size also.

But in Ahmedabad we do not find a single mill with more than 80 thousand spindles; and a large number of them are confined to the class 15-30 thousand spindles. In the frequency distribution of looms also the same phenomenon is noticed, though here in Ahmedabad the frequencies are more evenly spread in the different classes, and there are some very big mills of more than 1,200 looms. Another interesting fact that can be noticed is that the fall in frequency in Bombay is confined mainly to the modal class, and the rise in frequency in Ahmedabad is again confined to the modal class of medium size 15 to 45 thousand spindles. In the rest of India a large percentage of increase is in the small size less than 15 thousand and next comes the median size 15-30 thousands. This evidently shows that though the class 30-45 might have been the optimum size for Bombay prior to 1925, the new factors have changed the optimum and hence mills of that size were losing ground. On the other hand, these new factors are making the smaller and medium units the optimum size. In Bombay the 'Modal' class in weaving changed from 800-1,000 in previous periods to 600-800 in the final years; in Ahmedabad and the rest of India, it continued to be 400-600 and 200-400 respectively.

The Cotton Tariff Board of 1932 made their estimates of the costs of production of yarn and piecegoods on the basis of the costs in what they considered to be the optimum unit.¹ Except in the case of the Ahmedabad mills, they accepted as a reasonable economic standard a capacity corresponding to not less than 1,000 looms and 35 to 40 thousand spindles, and this represents the average size of a spinning mill in Bombay. Their standard for an efficient Ahmedabad mill is one possessing about 25 thousand spindles and 600 to 700 looms. At the same time, the Board recognized that it was impossible to lay down any rigid standards as to the minimum economic capacity of a mill for two reasons "(1) the fact of the existence of a central organisation for the common services of several mills renders the size of the individual mill a matter of relatively smaller moment (2) a small mill under a management which gives minute and careful attention to the affairs of the mill may show far better results than a large mill under a slack or routine management." Judged from the standard of the Tariff Board, 142 out of the 252, i.e., 56%, of the spinning mills and 231 out of 280, i.e., 83% of the weaving mills in India were below the optimum size. Even from the lower Ahmedabad level of 147, i.e., more than 50% of the weaving mills are below the optimum level. But that the level fixed by the Board is high even for an industrially advanced country reputed for big business like America can be seen from the following table.²

Number of spindles	Less than 10	10 20	20 30	30 40	40 50	50 60	60 70	70 80	80 100	Above 100	Total
Frequency in											
U. S. A.	280	277	131	74	52	42	29	19	34	46	984
China	10	22	37	23	9	6	10	3	4	1	125

1 Vide Report, pp. 97-99.

2. Vide *Textile Industries—An Economic Analysis* H. G. Michel, p. 92.

From this table we find that 688 out of 984, i.e., more than 70% of the mills have below 30 thousand spindles and more than 75% have less than 40 thousand. This table clearly shows that the technical optimum of a mill is relatively small, and the optimum size for this industry may largely be explained by the market optimum and overhead charges. The same conclusion will be arrived at from the frequency distribution of the mills in China also given above.

Now we may explain the local divergence of the optimum size namely the modal size of mills in Bombay, Ahmedabad and the rest of India and the dispersion of size. The big size of Bombay mills is partly due to their early history. During the last quarter of nineteenth century and the early part of this century, the prosperity of the Bombay mills depended upon the large exports of yarn (especially coarse variety) to China and Japan, and in this section large mills have a decided advantage over smaller concerns because the products are standardised varieties.¹ But later when this trade was lost, these mills had to set up weaving establishments, and the larger size of their spinning sections, necessitated larger weaving sections. In fact, if separate weaving mills should have been set up, this difficulty would not have arisen, and the two sections might have developed independently as in Lancashire and Japan, though there might be a few combined mills. So long as Bombay had almost a monopoly in the local market, large quantities of cloth could be manufactured in these mills, and sent to different parts of the country. But with the increased development of production in Ahmedabad and other centres, the market for Bombay mills became limited and hence the optimum size of previous years became impracticable under new conditions. This accounts for the large fall in the frequency of the modal class between 1925 and 1937. It has already been pointed out that the overhead charges consisting of the cost of power, rent, taxes, etc., are higher in Bombay than in other parts, and this naturally necessitates bigger mills in Bombay, to equalise the cost of overhead charges per unit with other centres. Another cause for these local differences is sometimes attributed to the different methods of promoting and financing a mill prevalent in different centres. "In Ahmedabad the cotton mills are organised on lines more or less resembling the private limited liability type, wherein most of the shares are held by the managing agent and a few of his friends who have confidence in him. They depend for their working capital on public deposits which again depend on the confidence of the public in the managing agent. Naturally this sets a limit to the size of the unit. On the other hand, the Bombay mills are floated on the lines of the public joint stock companies and the activity of the share brokers on the stock exchange and the readiness of the public and the banks to deal with these mills made the question of financing these bigger mills easier."² Finally, Bombay being a port town is better placed than Ahmedabad to export to foreign countries like Ceylon, Straits Settlements, Burma, South Africa, etc., and for such large demands of standard goods big mills are better suited.

1. *Small Industries of Japan*, p. 95. In Japan "while spinning of yarns is carried on solely in large establishments, a considerable part of weaving has to be allotted to small industries."

2. P. B. Lokanathan, *Industrial Organisation in India*, p. 95.

The disadvantages of smaller mills in upcountry centres are counter-balanced by some important advantages in other directions. Their proximity to cotton-growing areas and cloth-distributing centres gives them a decided advantage over those in Bombay in the matter of railway freights which form not an unimportant part in the total cost. Also they can easily alter the nature of their products to suit changing public tastes; and this coupled with the possibility of closer supervision and attention paid by the managers gives them an advantage over very big mills which will be successful only in producing stereotyped products. These arguments again explain the difference in the average size of mills in Ahmedabad and other parts of India. Because the mills in the former centre have to cater to the needs of distant places, the average size of those mills need necessarily be greater than those of purely local mills which confine their trade to particular localities.

As regards the dispersion of the mills about the types, the very factors which determine the average size determine also the dispersion. The standard of managing ability, and the extent of fixed and floating capital available determine the range of variation. The object of an entrepreneur is to make the maximum amount of profit possible on a particular business. Many factors operate in enabling him to gain this end, and the size of the unit depends upon his calculations regarding the effects of these different factors. So the relative importance of these factors to different individuals bring about the differences in the sizes of the different mills. It has already been pointed out that Bombay has got special facilities for raising large amounts of capital, and possesses business magnates capable of running such big concerns. For a long time it had also a large export trade in yarn in the beginning and even in piecegoods during the early twenties, all these factors gave scope for a wider dispersion of mills in Bombay than in Ahmedabad. Though the average size of the mills in other parts is small, some centres like Madras, Cawnpore and Calcutta, have equal facilities with Bombay for big concerns, thereby increasing the dispersion of the size of these mills. The smaller average size makes the relative dispersion all the more greater.

Apart from these factors, the nature of the product is an important factor in determining the optimum size. In fact, it is often difficult to say whether the smaller mills are due to the type of demand for products or whether the type of products that can be efficiently produced determine the size of mills. The following tables give the shares of the total of the different counts of yarn and varieties of piecegoods produced in each centre.

PERCENTAGE OF EACH VARIETY IN THE
TOTAL PRODUCTION OF EACH CENTRE
YARN

Period (3 years average)	Bombay				Ahmedabad			
	Counts				Counts			
	1-20	21-30	31-40	Above 40	1-20	21-30	31-40	Above 40
1922-24	68	29	2	1	43	50	6	1
1925-27	64	32	3	1	41	48	7	4
1928-30	59	31	7	3	37	46	12	5
1931-34	56	31	9	4	40	36	14	10
1934-37	51	30	13	6	41	27	18	14

PIECEGOODS

Period (3 years average)	Bombay				Ahmedabad			
	Dhoties	Shirting	Coloured	Cambries				
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1922-24	11.4	32.8	38.1	0.3	47.6	24.7	14.0	0.3
1925-27	12.3	33.6	35.4	0.1	45.7	19.7	24.1	0.3
1928-30	19.7	31.5	29.6	0.4	43.8	24.3	21.7	0.8
1931-34	26.0	34.5	21.6	1.3	39.0	19.4	29.4	4.4
1934-37	28.8	33.1	19.7	3.4	32.4	19.5	31.5	6.4

We find that Bombay allots a greater share than Ahmedabad to counts below 30, whereas the share of higher counts is greater in the latter, and though in dhoties the share in Ahmedabad is still greater than in Bombay, it has been heavily falling in the former whereas it has been increasing in the latter. The share of coloured goods and cambries and lawns is rapidly rising in Ahmedabad whereas in the former section, Bombay records heavy fall. All these factors show that the smaller units in Ahmedabad are specialising to a greater extent in finer qualities of yarn and piecegoods whereas bigger mills in Bombay are successful in manufacturing standard types of piecegoods like dhoties, shirting, long cloth, etc., and the production of large quantities of coarse yarn. It is interesting to note that even in Japan, "the large-scale spinning and weaving mills are engaged in producing simple articles like shirting and sheeting that can be produced in large quantities while the specialised weavers devote their efforts to produce articles like drill, satin, flannel, and crepes, etc., which cannot profitably be manufactured by large-scale production."

It may be of interest to examine whether the distributions of mills according to spindles and looms follow any natural law as in the case of

biological and other data. Though these distributions suggest Pearsonian forms, it was pointed out by Mr. Gibrat that in the economic data the more suitable form is the law of proportional effect, and this form can be got by normalising the distribution by the following transformation. $Z = a \log (x - x_0) + b$.

Mr. Gibrat puts $C = 100/a$ and considers C as a measure of the inequality (i.e., skewness) of the distribution. It is not necessary here to go into the details of the curve-fitting. The following table gives the results of the application of the method to the different distributions.

Year	Spindles		Looms	
	a	b	a	b
1925	1.561	-1.569	1.370	-1.522
1929	1.535	-1.456	1.572	-1.594
1934	1.577	-1.530	1.494	-1.482

Goodness of fit of the curves.

$P(x^2, n)$

Year	Spindles	Looms
1925	0.267	0.836
1929	0.677	0.262
1934	0.176	0.137

The second table suggests that the distributions are reasonably described by the curves with the coefficients given in table I and the coefficient of inequality of the distribution is almost the same for the spindles as well as the looms.

JUTE INDUSTRY

The optimum size of a jute mill is determined to a large extent by the market as in the case of the cotton industry. The technical optimum here is small and the size can be increased by mere duplication of machines.

As details of the number of spindles in each mill are not available, the size of the industry has to be studied with respect to the distribution of looms only. In the case of this industry two difficulties arise. (a) There are several instances of the same company having two or more mills in the same place. Hence we can get the frequency distribution of mills but not of plants. To get over this difficulty, the distribution of mills in different groups is given respectively thus: (1) Single plant group, (2) Two plants group and (3) Three plants group. (b) A greater difficulty which vitiates this study to some extent arises out of the fact that since the twenties there have been schemes of restrictions for various periods, and hence a certain percentage of the looms were sealed by mutual understanding among the Association mills which form more than 90% of the total mills in the country. Hence the optimum size of the looms working is not the same as that of the looms installed. Owing to the difficulties in making adjustments for this factor the frequency distribution of the

looms installed only is given in the following table, for the three years 1931, 1936 and 1939.

Number of Looms (^{'00})	Single plant			Number of Looms (^{'00})	Two plants			Three plants		
	1939	1936	1931		1939	1936	1931	1939	1936	1931
0—2	5	...	...	8—10	2	2	2	1	1	1
2—4	7	3	4	10—12	4	3	3	...	1	1
4—6	18	14	14	12—14	4	4	4	...	...	...
6—8	13	14	12	14—16	2	2	2	...	...	..
8—10	15	12	12	16—18	2	3	4	...	...	...
10—12	3	3	3	18—20	1	...	...	2	2	2
12—14	2	2	2	Above 20	...	1	..	..	...	...
Above 14	1	..	...					
Total.	64	48	47		15	15	15	3	4	4

The figures show that whereas there is a loss of one concern with 3 plants, the number of concerns with 2 plants remained constant, and there is large increase in the number of single plants. It must be remembered that all this increase is not due to the establishment of new mills, because a number of mills which formerly were out of the Indian Jute Mills Association, later came into it. Even in 1939, a few mills having looms of about 2% of the aggregate, were out of the Association. It is interesting to note that all the non-Association and new mills are of very small size and have single plants only.

The above table shows that for single plants 400-600 looms was the modal class in 1931 and 1939 and in 1936 class 600-800 is also bracketed with it. In fact the three classes 400-600, 600-800 and 800-1000 are the most important in all years, and between them contributed over 80% in the first 2 years and above 70% in the last, to the total number of mills. All but one mill in 1939 have less than 1400 looms. In the 3 plants and 2 plants groups, none has less than 800 looms and as the total number of mills is small, the frequency distribution is even less.

The following table gives the average size of a plant in the different sections.

Year	Single plant	Two plants	Three pl	Total
1931	694	671	491	659
1936	707	683	491	670
1939	658	657	535	647

The average number of looms in single plant, and two plant concerns increased between 1931 and 1936, and decreased to less than 1931 level in 1939. This was partly due to the addition of a large number of small single

plant mills during this period. In the three plant section the figure was constant in the first two years and increased in the last. But the total follows the same direction as the first two types. In the aggregate the average size of a plant was about 650 looms. The difference between the average and sizes of the first and second types was not great but that of the third was much less.

We may now compare the average size of plants in India with that of linen (flax) and jute industries in the British Isles. The following table gives the frequency distribution of mills therein.

Looms	Frequency
1—200	53
201—400	49
401—600	17
601—800	12
801—1000	6
Total.	137

We find from the above that the modal class is the lowest class and the next highest is the next class 201—400. No mill has more than 1000 looms. This shows that the average size of Indian mills is greater than that of the United Kingdom mills. This fact cannot be explained either by the want of financial resources or of managing ability in the United Kingdom. The real reason has to be found in the market. Whereas the United Kingdom caters only to a limited market in that country and on the continent, India supplies to all parts of the globe. This extensive market is responsible for the large size of mills in India which are guided solely by market optimum. There is no lack of finance or managerial ability as all the mills are in the hands of strong and capable managing agents. That the financial and managerial optimum is not responsible for limiting the optimum size of these mills is brought out by the following table which shows the concentration of large number of mills under the same managing agency.

No. of companies.	1	2	3	4	11	Total.
Frequency.	10	7	—	4	2	23

Thus the 62 companies are in the hands of 23 managing agencies and though 10 of them have only one each and 7 two each; there are 2 agencies having 11 each, i.e., nearly a third of the number of companies is in the hands of these two managing agents. It must be noted that there are two types of jute goods that are usually manufactured, namely, sacking and hessian. In each the width of the looms varies considerably. The table in the appendix A shows the total number of looms of each size (according to the width) in both types in 1938. The largest demand for sacking looms is for the sizes 36", 37" and 37½", the last mentioned being the modal class. The range of variation is from 32" to 60". In hessian the modal class is 46½" and the four other classes which have more than 1000 looms are 52½", 46", 52", and 53½" in order of importance. The range of variation

in this class of looms is from 41½" to 86½". Thus both the average size and dispersion of hessian looms are greater than those of sacking looms. But each mill usually possesses more than one size of each type of looms. The following table of double entry shows the joint distribution of the two types of looms in the above 62 concerns.

		Sacking						Total
		1	2	3	4	5	6	
Hessian.	1	2	1	.	.	.	.	3
	2	9	5	4	.	.	.	18
	3	10	8	4	1	1	.	24
	4	2	3	1	1	.	1	8
	5	1	1	1	.	.	.	3
	6	.	1	1	.	.	.	2
	7	1	.	.	.	.	.	1
	8	.	1	1	.	.	.	2
	9	.	1	.	.	.	.	1
Total		25	21	12	2	1	1	62

This shows that the most important combinations are 1 and 2 and 1 and 3 or 2 and 3 of sacking and hessian looms respectively. Also the average number of types of hessian looms in a mill is greater than that of sacking looms as can be expected from the greater dispersion of the former in the above table. There are usually 2 or 3 types of hessian looms and 1 or 2 types of sacking looms in each mill. The larger number is perhaps due to the ownership of 2 or 3 plants by the same company. The following table gives the frequency distribution of the total number of types of looms in each concern.

Number of looms.	1	2	3	4	5	6	7	8	9	10	11	Total
Frequency	—	2	10	15	14	8	3	5	1	2	2	62

This shows that the modal class is 4 types of looms but the frequency of 3, 4 and 5 types of looms is quite high. These three classes comprise more than 60% of the total. In this case also the existence of about 13 mills with more than 6 types of looms each can be explained by the existence of 2 or 3 plants under the same ownership.

The various facts noted above show that Indian mills have to manufacture a large variety of standardised goods, some in very large quantities, to cater to a world wide market and the optimum size is fixed by the market. But during times of depression the difficulties of increased production brought about by the bigger size of the plants are sought to be overcome by limiting the production. But this tends to increase the cost of production per unit during such periods, and naturally the competitive power of the industry in foreign markets will be diminished.

APPENDIX A

Sacking looms		Hessian looms			
Reed Space	No. of Looms	Reed Space	No. of Looms	Reed Space	No. of Looms
32	2,212				
32	1,438	41½	108	57	241
33	931	42	318	57½	371
33½	404	42½	42	58	145
34	—	45½	724	58½	389
34½	42	46	4,037	60	275
36	4,395	46½	15,643	60½	116
36½	1,277	48	43	62½	2
37	4,828	48½	20	64	284
37½	5,802	49	6	64½	100
38	154	50	419	66	259
39½	183	51	916	67½	184
40	6	52	2,223	68½	87
41½	36	52½	6,605	78	28
46½	16	53	324	80	6
52½	95	53½	1,151	80½	46
60	11	54	57	84	112
Others.	820	54½	390	86½	75
		56	975		
		56½	459		
Total	22,650			Total	37,683
Grand Total.		60,333			

SUGAR INDUSTRY

The main factors which determine the economic size of sugar factory are (1) amount of cane available for milling, (2) transport facilities and (3) access to markets. The technical optimum of a sugar factory is small, but if the above three factors are favourable, the size can be increased considerably so that the incidence of overhead charges per unit may be reduced. The following table shows how widely the average output of a sugar factory differs in various countries.¹

Country	Average annual output (thousand tons)	
Cuba	...	26.0
Hawaii	...	18.0
Philippines	...	17.0
Porto Rico	...	15.0

1. Vide Maxwell, *Economic Aspects of Cane Sugar Production*, p. 104.

Country		Average annual output (thousand tons)
Australia	...	14.0
Java	...	12.5
South Africa	...	9.5
Mauritius	...	5.5

The economic size of a factory is largely conditioned by the availability of cane in sufficient quantity within a reasonable radius round the factory, because sugar-cane rapidly loses its sucrose content after being cut. In regions where large quantities of cane are available and the factories can be assured of a continuous supply, it may be advantageous to have a very large factory. But in many parts of India, the cane holdings are small and often scattered, and the production of 'gur' competes with the mills for the cane supplies. Hence, in this country, it should be very difficult to ensure an annual output of sugar which would compare with that obtained in other countries. In view of these conditions and considering the output and cost of the then existing factories in India, the Sugar Tariff Board of 1931 on sugar considered that a factory with a crushing capacity of about 400 tons would be an economic unit. When this matter was investigated again by the Sugar Tariff Board of 1938, they found that though there has been no marked change in transport facilities since 1931, the acreage and concentration of the land under cane and the total cane available for supply to factories has definitely improved and that some factories especially in Bombay were even able to obtain the major portion of their requirements from their own farms. Considering the different factors, they came to the conclusion that a factory with 500 tons capacity would be a reasonable economic unit to adopt for the whole of India.¹ But they pointed out that from the marketing point of view much depends on the location of a factory in relation to other factories. In places where the factories are few and far between even small size plants may compete successfully with optimum units situated at greater distances on account of the freight advantage in the local market. "In areas where factories are located at considerable distances from one another a factory of 400 tons capacity may constitute an economic unit and even a factory of 50 tons capacity may be able to manufacture at a profit."²

The table in the Appendix gives the frequency distribution of the sugar factories working in different years, according to their capacity. To investigate the regional differences, if any, these distributions are given for individual provinces. The data are collected from the annual Reviews of Indian Sugar Industry published as supplements to the *Indian Trade Journal*. This study commences with 1932-33 because tariff protection was given to this industry in that year. It will be noticed that the number of factories working increased from 54 in 1932-33 to 121 in 1933-34. This sudden expansion was obviously the result of the protection, and the factories which were immediately constructed came to working order only in the

1. Report of the Indian Tariff Board on Sugar Industry, 1938, p. 61.

2. Ibid, p. 61

subsequent year. The 'modal' class for the mills in the United Provinces was 250-449 in 1932-33, and it improved to 450-649 in 1934-35 and to 650-849 in 1935-36. Though in 1936-37 there was a slight set-back, in 1937-38 it recovered to 650-849 more definitely. As regards Bihar, it was 450-649 in 1932-33 and 650-850 in all other years. But in the aggregate of regions other than these two provinces, the modal class is the lowest one 50-250 in all years. The following two tables show the number of mills below and above the "economic size" (according to the Tariff Board).

Province	Below					Above				
	1933 -34	1934 -35	1935 -36	1936 -37	1937 -38	1933 -34	1934 -35	1935 -36	1936 -37	1937 -38
United Provinces.	22	27	24	22	27	15	19	28	30	46
Bihar.	9	10	8	7	2	15	16	20	21	34
Punjab.	5	7	6	6	4	—	—	—	—	—
Bengal.	—	5	3	4	4	—	1	1	1	1
Madras.	6	7	6	8	8	1	2	2	2	2
Bombay.	4	2	3	4	3	—	—	1	1	2
States.	2	4	3	1	4	2	2	2	4	6
All-India.	48	62	53	52	42	33	39	56	59	81

This shows that in each region there had been a definite tendency for the increase in the number and share of mills above the economic size fixed by the Tariff Board, and this is specially noteworthy in the case of the United Provinces and Bihar. Though in 1934-35 the number of mills below the economic size increased, the proportion decreased due to the great increase in the total number of mills and in subsequent years both the number and share of these mills gradually came down. But it is important to notice that all mills in the Punjab were below the economic size and a high percentage of mills in Bengal, Madras and Bombay also suffered from this disadvantage. The smaller size of mills in the Punjab is explained mainly by the want of good cane in sufficient quantities, due to the poor sucrose content. In Madras the main difficulties are the smaller area under cane due to the competition of other crops and the handicaps experienced by factories in purchasing the requirements from the small growers. In Bengal also there is a similar difficulty due to the competition from jute. In Bombay the high costs of cane cultivation generally explain the smaller area under the crop. But that province is unique in that all the factories but one grow for themselves either the whole or the major portion of their cane requirements. Thus the smaller size of the factories in these three provinces is mainly explained by the smaller supply of cane. But they have an advantage in freight rates in local markets compared with the sugar mills of Bihar and the United Provinces and are thereby able to stand the competition of those mills. The following table gives the 'Median' and 'Quartile' deviation of the size of mills in the United Provinces, Bihar, and All-India.

Year	Median (Tons)			Quartile deviation (Tons)		
	U. P.	Bihar	All-India	U. P.	Bihar	All-India
1933-34	617	523	513	180	145	185
1934-35	625	514	484	202	179	206
1935-36	589	710	560	206	222	213
1936-37	590	728	571	195	229	238
1937-38	725	738	698	193	223	260

We find that the average size and dispersion for Bihar are greater than those for the United Provinces and that for both the Provinces these values have increased between 1932-33 and 1937-38. But this increase is greater in the United Provinces than in Bihar. The small size of mills in other parts of India with a large dispersion is due to the preponderance of small mills with a few mills of large size here and there. The All-India figures are nearer to those of these two Provinces because nearly 75% of the mills are in the United Provinces and Bihar. As in cotton we find that the average size of mills is greater for those which supply to distant markets than those which cater to local markets. The gradual increase in the number of mills above the economic size as well as the average size show that the industrialists are developing the mills with respect to size on healthy lines. But still the average size of Indian mills does not compare favourably with those of Java and Cuba which cater to the international markets.

DISTRIBUTION OF SIZE OF SUGAR MILLS

	1933-34		1934-35		1935-36		1936-37		1937-38						
Tons.	U.P.	Bihar All India	U.P.	Bihar All India	U.P.	Bihar All India	U.P.	Bihar All India	U.P.	Bihar All India					
50—249	9	3	23	11	2	26	10	2	23	8	2	26	7	1	23
250—449	13	6	25	16	8	36	14	6	30	14	5	26	10	1	19
450—649	26	9	40	22	8	34	16	6	29	20	7	33	8	7	22
650—849	8	10	20	12	9	22	21	10	33	18	9	30	24	10	37
850—1049	3	4	7	3	6	12	1	5	9	2	6	12	13	7	26
1050—1249	3	-	3	3	-	3	4	2	7	5	2	7	2	2	5
1250 & above	1	1	3	1	1	3	4	3	7	5	4	10	7	5	13
Total	63	33	121	68	34	136	70	34	138	72	35	144	71	33	145

IRON AND STEEL INDUSTRY

Pig-Iron:—Since the time when coal began to be used in the smelting of iron, ore the size of plants began to increase very largely. Apart from the numerous small indigenous turnaces till 1930 there were altogether four large establishments in the country working on modern lines, namely, (1) Tata Iron and Steel Co., (2) Bengal Iron Co., (3) Indian Iron & Steel Co., and (4) Mysore Iron Works. Though Bengal Iron Co. was the oldest it had been producing pig-iron only for export and in 1936 it was amalgamated with the Indian Iron & Steel Co., into a big concern producing steel also. The sizes of the different concerns are given below.

Company	No. of Furnaces.	(000 tons.)		
		Average output. 1924-1928.	Projected output. 1935.	Average output. 1936-38
Tata Iron & Steel Co.	6	569.5	600	877
Bengal Iron Co.	5	96	150	671
Indian Iron & Steel Co.	6	286	500	
Mysore Iron Works.	1	17.5	25	19

(Vide Capital, Indian Industry, Trade, etc., Supplement, 1935, p. 53.)

The very small size of Mysore Works is due to the fact that charcoal is used in the furnaces. The other two concerns are of adequate size. The chief factors which influence the size of a plant are (1) the availability of raw materials, namely, iron ore and coal, in sufficient quantities and (2) market for the product. The pig-iron produced by the Tatas finds a ready use in their steel works and only a small quantity is exported. India has a lucrative trade in pig-iron, and the concentration of high grade ore and coal in a small region near the border of Bihar and Bengal provinces facilitated the establishment of big companies to produce pig-iron very cheaply. Of the 6 blast furnaces of the Tatas 2 are capable of producing 1,200 and 900 tons of pig-iron daily, 2 are of 750 tons capacity and one of 250 tons. It has a total maximum output of over 1 million tons of pig-iron per annum. Of the 6 blast furnaces of Indian Iron and Steel Co. 2 are modern furnaces capable of producing 800 tons daily.¹ The Mysore Works is the only charcoal blast furnace in the world which has been erected in recent years.² Its capacity is about 25 thousand tons per annum.

The Steel Industry:—There are two steel works using pig-iron, namely the Tata Iron and Steel Co. at Jamshedpur and the Mysore Iron Works. In addition there are a few re-rolling mills at Calcutta, Benares, Ghaziabad, Cawnpore, Lahore and Negapatam using scrap materials. The Tatas are the biggest concern comparing favourably with even those in foreign countries. The first plant of the Tatas was very small producing about 125 thousand tons and later it was extended to produce about 400 thousand tons.

1. Records of the Geological Survey of India, 1935.

2. Capital, Trade, Engineering Supplement, 1928.

But the plant after extension proved to be ill-balanced and ill-proportioned and in trying to remedy it, the capacity had to be increased to about 600 thousand tons. Though it was thought to be uneconomical at that time, the demand for its products increased, and at present it is working at full capacity.

The technical optimum is very high in this industry because "large blast furnaces do not employ as much coke nor as many men, nor do they cost as much originally, in proportion to the iron produced, as small furnaces."¹ Certain overhead expenses such as capital and maintenance charges also fall less heavily on the unit of output if the size of the mills is large. But the size of the typical plant varies widely in different countries. It will be interesting to note that the plants in England are comparatively smaller than those in the United States and Germany. The larger size in these two countries is explained by (1) the existence of an enormous home demand for highly standardised qualities, (2) the concentration of mineral resources in small regions, and (3) by the fiscal protection granted to the industries in their countries, which promoted combinations with a view to maintain prices of monopolistic groups. Thus "in some degree the emergence of great combinations has depended on the geographical and geological accidents, on fiscal policy, and on the desire of producers to secure monopolistic advantages."² The chief causes for the smaller units in England were (1) wider dispersion of raw materials, (2) free trade in the home market, (3) variety of output to cater to the different markets of the world and (4) a greater demand for specialities and for constructional material in which smaller units are suitable for exercising greater control on quality.

In the light of these facts it will readily be seen that in India a large concern was more economical because the industry developed under tariff protection and the market demand was only for standardised qualities of goods while specialised goods were imported. The large amount of capital required and the limited market for the products discouraged the establishment of any more concerns and the Tatas became the monopolist producers. The smaller and uneconomic size of the Mysore plant was the chief cause of its difficulties. Of late certain attempts are being made to start small concerns consuming scrap from the railways, mills, etc., for manufacturing bars, plates and agricultural implements. But the total output of all these concerns is very small, and the quality of the products also is not high. One chief handicap for these re-rolling mills is the fact that the quantity of scrap available is very much limited. They are able to compete in the market, in spite of the high manufacturing costs because their overhead charges are small, and in the neighbouring market they have a freight advantage also. They cannot be reasonably successful unless they roll steel billets also and specialise in quality goods. But they complained that the Tatas were not helpful in supplying the billets at cheap rates, but on the other hand were selling the products at competitive rates. In spite of the efforts of the Commerce Member of the Government of India in 1939, these two interests

1. Allen, *British Industries and their organisation*, p. 113.

2. *Ibid.*, p. 117

could not be brought together. The present war has created an exceptional demand and the urgency of the problem is postponed. But in the opinion of the Indian Tariff Board on Steel Industry, 1934, "As in England and elsewhere, there is a place for these re-rolling mills in a well-organised industry, and that the growth of a re-rolling section of the industry capable of dealing with small orders, even of steel products which may compete with the output of the main steel producing works, will be a natural and desirable outcome of the present tendency."¹

Though the Tata's plant is economic under the present conditions, the size of any new plant must be smaller because the market available is limited. The Tariff Board remarked that if any new enterprise turned its attention to products not manufactured by the Tata Company, there was in addition to the 400,000 tons of protected steel, the market unprotected, in which the imports in 1929-30 amounted to some 250,000 tons. According to the Balfour Committee on Industry and Trade, a modern steel plant must have a minimum capacity of 300,000 tons of finished steel annually, if it is to work economically.² If the new concern be of this size it may have a sufficient market also. But the fact that the Indian Iron and Steel Co. is situated near the Tatas will undoubtedly raise complicated problems of its relationship to the Tata Company and the division of markets.

PAPER INDUSTRY

At the time of enquiry of the first Tariff Board on Paper Industry, i. e. 1924-25, there were 9 paper mills in India, and the Board estimated that for the 5 mills which it took into account the total capacity was 33,000 tons. By the time of the second Tariff Board in 1931, the capacity increased to 45,600 tons, mainly due to the installation of additional machines at Naihati and Poona and to the starting of a new mill at Rajahmundry. It was remarked by the Tariff Board of 1938 that "there has been no marked increase in the paper making capacity of the mills, but, except in 1932-33, there has been a steady improvement in the total output."³ The following table shows the number of machines and the capacity of important paper mills in India in 1925 and 1931. The details about the other mills are not available.

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1. Report of the Indian Tariff Board on Steel Industry, 1934, p. 141.
 2. Survey of Metal Industries (Balfour Committee Report), p. 8.
 3. Report of the Tariff Board on Paper Industry, 1938, p. 9.

	1925 ¹		1931 ²	
	No. of Machines.	Capacity in tons.	No. of Machines.	Capacity in tons.
Upper India Mill, Lucknow.	2	4,000	2	3,600
Titaghur Paper				
Mill, Titaghur	4	20,000	8	20,800
Karikurna	4			
Deccan Paper Mills, Poona.	1	1,700	2	4,000 ³
Bengal Paper Mill				
Co., Raniganj.	4	8,400	4	10,200
Indian Paper Pulp				
Co., Naihati	1	2,750	2	6,000
	16	36,850	18	44,600

The above table shows that the two mills having only one machine added one more during the period and increased the output. Of the 6 plants, three had 4 machines each and the other three 2 machines each. The average capacity per machine was about 2,500 tons a year. This table also shows that the technical optimum is comparatively small, and the size of the plant can be increased by duplicating the number of machines. The size of an optimum plant is determined by the cost of machinery and overhead charges on the one hand and the market available on the other. The optimum size for an Indian mill is reported to be "a complete four machine mill fitted with plants for undertaking all processes for converting raw material into paper."⁴ According to this estimate only 3 mills (all in Bengal) were of the economic size, the three with 2 machines each and the rest which had only one machine each should be considered uneconomical. But even in Great Britain "the usual size of a mill producing similar kinds of paper is one varying from two to four machines each, and it cannot be said therefore that the 3 mills having 2 machines each are necessarily uneconomic units of production"⁵ At the same time it must be remembered that the costs of machinery, etc., which form the bulk of the capital expenditure, are much higher in India than in England which necessitates larger amount for depreciation though the low labour charges partly compensate this disadvantage. Hence the market available for the product seems to be the more important factor. In fact with the extension of local market under the shelter of tariff protection, the production of these companies increased and the costs of manufacture have come down. It will be interesting to note that all the three big mills are situated in Bengal which has strong localising factors for this industry, and as Bengal supplies to all parts of India, these big mills are

1. Report of the Tariff Board on Paper Industry, 1925, p. 107.

2. " " " " 1931, p. 10.

3. Including one more mill in Bombay.

4. P. S. Lokanathan, *Industrial Organisation in India*, p. 122.

5. *Ibid*, p. 122.

suitable and economical. But the small units in other parts are able to stand the competition on account of the freight advantage over long distances from Bengal. Of late a tendency for wider dispersal of the industry is apparent, and in these conditions, as the area within which the products can be sold will be smaller, a plant with 2 machines may be more economical, unless some special variety of paper having a large market is produced.

CEMENT INDUSTRY

The minimum size of cement factory is one having only one kiln, and the main factors which influence the size are (1) the market and (2) the capital and overhead costs which influence the extra costs of production on each unit, apart from the raw materials and labour. Even in 1931 there were only 13 cement companies in India. This industry grew rapidly in the post-war (1914-18) period. The market for this product was very limited and in fact in the first decade itself the industry suffered from overproduction. This led to the establishment of a marketing organisation to propagate new uses for it. Even to-day the per capita consumption of cement in India is very small when compared to foreign countries.¹ This fact must be borne in mind when discussing the optimum unit. The following table shows the maximum capacity of the different companies in 1925 and 1931. It is not necessary to consider later years because with the advent of depression in 1931 there was a setback in the industry and to ward off the evils of overproduction the then existing companies were amalgamated into the Associated Cement Companies Ltd. Later a rival agency the Dalmia Cement Company began to start several companies in different parts of the country. Hence at present all the existing companies come under one of these two groups, and the question of optimum size of individual plants loses much of its importance.

	Capacity 000 tons.	
	1925 ²	1931 ³
Indian Cement Co.	30	40
Katni Cement Co.	60	85
Bundi Portland Co.	65	160
Dwarka (Okha) Portland Co.	100	100
Sone Valley Co.	50	130
Jubbulpore Portland Co. (united)	60	50
Gwalior " "	40	45
Punjab " "	36	80
S. India " "	10	10
Shahabad " "	—	120

1. Per capita consumption in some countries

United States	558	lbs.
Belgium	300	"
France	270	"
United Kingdom	280	"
Italy	150	"
India	4	"

(Vide Capital, Industry, Trade, etc., Supplement, 1931, p. 66.)
2. Tariff Board Report on Cement Industry, 1925, pp. 50-51.
3. Capital, Industry and Trade Supplement, 1931, p. 40.

It was estimated that a factory with a two-kiln plant capable of producing 40,000 tons of cement a year would be of an economic size for this country.¹ If this estimate was correct all but one of the above mentioned companies were really economic. Some of them were of much bigger size because they were supplying to far distant markets of the country. But of late several new companies have been started in Southern India, the Punjab, etc., and the freight advantage for these mills makes their competitive power stronger. In fact the Associated Cement Company itself started new factories in these areas to combat their rivals who wanted to take advantage of this weakness. As the industry disperses, a plant of medium size may prove more economical because the market for the product of each mill may be limited, unless the demand for cement increases tremendously.

COAL INDUSTRY

The size of a coal company is determined by a diversity of factors, namely (1) the geological and geographical causes beyond human control, (2) the distribution of the property among the surface owners from whom the mining companies lease the rights and the terms of their leases, (3) the capital of the mining concerns, (4) the quality of the coal and (5) the market available for it. The size of the representative firm varies considerably in different important coal mining countries like the United Kingdom, Germany, the United States of America and France. The position in England with its large number of independent undertakings is in great contrast with that in Germany and various measures have been taken since 1930 for the amalgamation of undertakings where it was found to be in the national interests. Germany went a step further in bringing the trade and industry under the direct control of the Reich Minister of Economy. With the greater mechanisation and improved methods of management of industry, the units in America are much bigger than those in the continent.

The table in the Appendix gives the distribution of the coal mines in India according to output in the years 1900, 1920, 1930 and 1938. As Raniganj and Jharia fields are the most important coal mining centres, the distribution of companies in these two regions are given separately. The number of companies was very small in 1900 and it increased rapidly in the following two decades. But later there was a fall in the number, reaching the lowest ebb in 1935, while there was some revival in subsequent years. The rapid expansion between 1900 and 1920 was mainly confined to very small mines raising less than 10 thousand tons per year; their number increased five fold while that of bigger companies raising more than 50 thousand tons per year only doubled. The rate of increase diminished as the size increased. But between 1920 and 1930, whereas there was a fall of more than 50% in the lowest class and a slight fall in other classes, there was an increase in the number of companies raising more than 30 thousand tons, the increase being considerably high in companies raising more than 50 thousand tons. During the revival the small companies

1. Indian Tariff Board on Cement Industry, 1925, Evidence Vol., p. 80.

regained a part of their lost position. In Jharia, throughout there had been a great increase in the number of big mines along with those of small ones. But between 1920 and 1930 there was a heavy fall in the number of small mines with an output of less than 10 thousand tons per year, while in other classes the fall was not so heavy. The number of companies raising less than 10 thousand tons was less in 1938 than in 1930. In all other centres, small mines predominate, there being only a few very big companies here and there. In the aggregate we find a large increase in the number of small mines between 1900 and 1920, the number in the latter year being nearly 8 to 9 times that in 1900 in the lowest two classes, whereas the higher classes show much smaller increases. But in subsequent years while a good number of small companies suffered losses and closed down, a few of them extended their operations and the number of big mines increased. Between these two years the share of small mines raising less than 10 thousand tons per annum increased from 46 to 55; and the next class 10-20 thousand tons from 10 to 14. Other classes showed a decrease, the share of mines raising more than 50 thousand tons recording a fall from 21 to 13, or nearly 40%. Between 1920 and 1930 the lowest class lost from 55 to 42 or 25% whereas the shares of mines of over 50 thousand tons increased from 13 to 23. There were only slight changes in share between 1930 and 1938.

The large increase in the small mines between 1900 and 1920 can be explained by two factors. During these years the demand for coal in India was rapidly increasing and every year a number of new concerns, which were necessarily small in the initial stages, were formed. Even small concerns raising coal from the surface could make some profits. But in the subsequent decade, demand slackened and hence a very large number of these small concerns were either closed down or expanded into bigger ones, to make them more economical. As the depression in coal trade deepened, the number of big concerns increased, and that of smaller ones decreased thereby showing the greater advantages of larger units. But it must be remembered that the age of the mine is a more vital factor in determining the costs of production and hence of the profitability of a concern. A mine with a low annual output may be a small mine working with reasonable efficiency, it may be a new mine not yet producing at full strength, or it may be an old mine approaching exhaustion. The proceeds from a small mine may be high owing to special advantages in the quality of coal and proximity to markets. When an attempt was made to balance costs against proceeds on different classes of mines then it became more difficult to generalise, for highly profitable undertakings were to be found in every size group. On the whole, advantage seemed to be with larger undertakings and this conclusion is in accordance with expectation. The advantages of larger units lie in their ability to effect greater economies in power, supplies, repair, transport, skilled workers, etc.

The following table shows the distribution of collieries according to the power used and the amount of coal raised in each sub-section in the two main coal raising regions, namely Raniganj and Jharia.

	Raniganj.				Jharia.			
	1919.		1935.		1919.		1935.	
	No. of collieries	Coal raised. 000 tons.	No. of collieries	Coal raised. 000 tons.	No. of collier- ies.	Coal raised. 000 tons.	No. of collier- ies.	Coal raised. 000 tons.
(a) Hand labour.	98	438	38	68	153	1024	38	207
(b) Steam power.	160	6,044	135	6,016	165	9901	150	6,919
(c) Electri- city.	3	319	10	1,265	8	1111	14	2,119

From this table we notice that both in Raniganj and Jharia the greatest fall in the number as well as output was in the collieries working with hand labour which must naturally be small. The fall in number was small but the output remained almost stationary in the collieries worked by steam power in Raniganj whereas in both sections there was a fall in Jharia. But there was an increasing tendency for electrification in both regions though the absolute number of such collieries was very small even in 1935. These facts show that it is the small collieries depending on hand labour that were the worst sufferers due to higher costs from inefficient methods of raising coal. The limitations of the use of electrically driven cutting machines must be recognised before recommending greater use of these methods. Even in 1931 the percentage of British coal cut by machines was as low as 38% compared with 78% in America in 1929. It was explained that the greater progress in America was due to the suitability of the seams for these processes and the inclined seams in Great Britain were not amenable to these mechanical methods. It is significant on the other hand that in Ruhr where the conditions of mechanical mines are as unfavourable as in Great Britain, the proportion of coal cut by machines should have risen from 2% in 1913 to 85% in 1928.

The causes for the smaller mines in India may partly be due to the large number of land and mineral owners, who do not usually arrange for expert advice. Often leases are given without proper regard to economical sizes and shapes, and without any conditions regarding the methods by which they have to be worked. Even though the largest consumers of coal in India, namely, Railways and Iron and Steel companies, either own collieries or have contracts with some big concern, a very large part of the second class coal is raised by uneconomic units. They do not possess any considerable advantage in the market because, domestic consumption of coal is very little in India, and even the existing resources are concentrated in a small region. Hence for export to distant markets (internal or external) big units are more economical from the point of view of either management

or greater mechanisation. "It is common knowledge that raising costs per ton vary inversely with output, and some of our witnesses assert that larger outputs from fewer mines are responsible mainly for the very considerable decrease in costs of production which must have taken place in order to enable coal to be sold at all at recent prices."¹

The East India Railway and the Bengal-Nagpur Railway are the most important carriers of coal from the fields. As in the case of some other industries, there is a great seasonal variation in the labour supply for coal fields. Workers are available in larger number at cheaper rates after the agricultural operations are over, i. e., between February and May. Unfortunately this period synchronises with the period of heavy traffic in railways due to the transport of agricultural products. The problem of adequate supply of wagons to meet such demands had often become difficult in former years.

1. Report of the Coal Mining Committee, 1937, Vol. I, p 23.

A P P E N D I X

FREQUENCY DISTRIBUTION OF THE COAL FIELDS ACCORDING TO OUTPUT

Output (000 tons)	1900			1920			1930			1938		
	Rani- ganj	Jha- ria	Others Total	Rani- ganj	Jha- ria	Others Total	Rani- ganj	Jha- ria	Others Total	Rani- ganj	Jha- ria	Others Total
Less than 10	32	10	3	45	165	167	45	377	77	98	55	230
10—20.	8	1	4	13	44	46	6	96	33	42	4	79
20—30.	9	3	-	12	32	32	2	66	18	13	4	35
30—40.	5	2	-	7	12	21	5	38	15	15	4	34
40—50.	4	-	-	4	10	12	3	25	11	13	4	28
50—100.	6	4	1	11	20	28	7	55	27	27	9	63
Above 100.	5	1	5	11	5	24	6	35	18	26	15	59
Total.	69	21	13	103	288	330	74	692	199	234	95	538
									225	255	130	610

SUMMARY

From the above survey of the distribution of the size in the different industries, we have seen that the number of industrial establishments was limited in the iron and steel, paper and cement industries. The other four industries present a reasonable number to form frequency tables of distribution. Cotton and coal industries have the largest number and next in order come sugar and jute. In all these four industries we find establishments of very small as well as very large sizes. It is interesting to note that while in all other industries the size of an average plant is smaller in India than in European and other countries, the size of the jute mills is much larger. Even in cotton and other industries there are some companies which compare favourably with those in foreign countries.

Apart from the technical optimum, market appears to be the dominant factor in determining the size of a typical plant. In this connection both the low purchasing power of the Indian masses and the large distances over which the goods have to be carried must be taken into account. In many regions, as both the density of population and their purchasing power are small, the amount of goods which a company can economically distribute is limited. This explains the preponderance of small units in all industries in different parts of the country. At the same time where technical considerations require, (as in the iron and steel industry) or goods find a wider market on account of quality or strong localising factors for the industry, we find the units in those regions to be much bigger. Thus the paper mills of Bengal, some sugar mills in Bihar and the United Provinces, some cement companies, etc., are of very large size. Again the age of the industry seems to have some influence on the size of the units. The larger size of the cotton mills in Bombay can partly be explained by the fact that they were established for the manufacture and export of yarn to foreign countries, and when they lost that trade and had to cater to the home market, they had to establish larger weaving sections, to balance with the production of yarn. But under the changed conditions, when there is a tendency for the wider dispersion of the industries, smaller units seem to be at a greater advantage than the larger ones. Thus the success of the Ahmedabad mills over those in Bombay is partly explained by this factor. The peculiarity pointed out above in the case of the jute industry is due to the fact that Indian jute goods have a world wide market and naturally to produce large quantities of standardised goods and to reduce the overhead charges per unit they have to be of a larger size. Similarly, England and Japan who send large quantities of goods to the different parts of the globe have their cotton mills, etc., of very large size. Influence of managerial and financial factors are not clearly seen because most of these industries are developed by managing agents who have a large number of the same as well as other industries under their control.

Chapter IV

PROGRESS OF THE INDUSTRIES

COTTON INDUSTRY

THIS is the premier and the oldest large-scale industry in India. It owes its origin to the enterprise of the cotton merchants of Bombay who made enormous profits in the trade of raw cotton during the American Civil War. Though it was at first intended to cater to the demands of the large internal market, its prosperity and development in earlier years was to a large extent due to the profitable export trade in coarse yarn to China and Japan. By the beginning of this century the predominant part of the industry which was concentrated in Bombay was the spinning section. The history of the progress of the industry during the present century may be divided into two periods; the one ending with the close of the great war of 1914-18 and the other from that date to the present. It is proposed to study the progress of the industry with reference to the number of mills, spindles, looms and also with regard to the production of yarn and piecegoods. For purposes of comparison and convenience of handling, all the figures are converted into index numbers with the pre-war quinquennium as base. This is a very convenient period for taking as base, because striking alterations took place in the growth of this industry and trade at about this time.

PROGRESS OF THE INDUSTRY DURING THE PRE-WAR PERIOD

The following table gives the respective index numbers of mills, spindles and looms working in the pre-war period:—

TABLE I
(Base: Average of 5 years 1909-1913)

Year	Index No. of mills	Index No. of spindles	Index No. of looms	No. of spindles per loom
1900-01	77	77	45	121
1901-02	77	78	46	119
1902-03	79	80	50	113
1903-04	80	81	51	111
1904-05	83	83	56	104
1905-06	84	85	59	100
1906-07	87	85	65	92
1907-08	95	90	75	86
1908-09	97	96	84	80

Year	Index No. of mills	Index No. of spindles	Index No. of looms	No. of spindles per loom
1909-10	97	97	92	74
1910-11	94	96	94	72
1911-12	101	99	97	71
1912-13	103	102	104	68
1913-14	104	105	114	64
1914-15	104	104	120	61
1915-16	103	103	122	59
1916-17	103	104	127	58
1917-18	108	106	131	57
1918-19	109	108	131	57

The table below shows that at the beginning of the century the number of mills and spindles were about $\frac{3}{4}$ the pre-war level, whereas the number of looms was only $\frac{2}{5}$ of it. The striking feature of the whole period is that whereas the indices of mills and spindles were keeping almost together, those of looms were increasing at a fairly higher rate. Comparing the two end years of the period we find that whereas the mills and looms increased by less than 50%, the number of looms nearly trebled during the interval. This has resulted in a great fall in the number of spindles per loom—from 121 in the beginning to 57 in the end. This fall was rapid in the pre-war period and the war period could not show much change due to the difficulties in importing machinery. This change in the structure of the industry was brought about by the change in the trade conditions. Before 1900, the prosperity of the industry depended upon the large export trade in yarn of coarse varieties with China and Japan. With the gradual loss of that trade the mill-owners set up more and more looms to manufacture cloth for local markets.

PRODUCTION OF YARN

The following table shows the indices of the total production of yarn as also of the chief varieties according to counts and also the share of each section in the total.

PRODUCTION OF YARN

(Base: Average of 5 Years 1909-1913)

Years ¹	Indices of counts				Share of counts			
	1-20	21-30	31-40	Total	1-20	21-30	31-40	Above 40
1900	52	36	53	55	79.8	16.3	3.1	0.8
1901	93	46	62	89	84.9	12.7	2.2	0.2
1902	100	59	67	89	82.8	14.9	2.2	0.1
1903	100	59	88	90	82.0	15.0	2.8	0.2

1. Official year April to March.

Years	Indices of counts				Share of counts			
	1-20	21-30	31-40	Total	1-20	21-30	31-40	Above 40
1904	97	66	91	90	80.2	16.6	3.0	0.2
1905	117	72	83	105	82.0	15.5	2.3	0.2
1906	109	79	92	101	79.4	17.7	2.6	0.3
1907	103	84	118	99	76.8	19.3	3.5	0.4
1908	105	86	110	102	77.1	19.0	3.1	0.8
1909	102	81	85	97	77.9	19.0	2.5	0.6
1910	94	94	96	94	74.2	22.5	3.0	0.3
1911	95	102	108	97	72.4	23.9	3.2	0.4
1912	105	108	105	107	73.5	23.1	2.9	0.4
1913	103	114	105	106	72.1	24.5	2.9	0.4
1914	99	107	100	107	72.7	24.0	2.9	0.3
1915	111	116	100	112	73.5	23.5	2.6	0.3
1916	100	117	129	105	70.5	25.2	3.5	0.7
1917	90	126	130	102	67.5	27.8	3.7	0.9
1918	84	129	103	95	65.3	30.8	3.1	0.7

From the indices of total production we notice that at the beginning of the century the production of yarn was only 10% below the base period level; the very low figure in 1900-01 being due to the incidence of plague in Bombay, which took a large toll of the mill labourers and scared away a good many more from the city. Subsequently production reached the peak level in 1905-06 mainly due to the Swadeshi movement, and this high level continued for nearly 4 years. There was a retrocession in the succeeding years caused by several factors, namely, the general wave of depression in the world cotton trade, the famine conditions in China, which was still the chief market for Indian yarn, and the waning of popular enthusiasm for Swadeshi goods. During 1912-14, however, the fall in the price of raw cotton stimulated trade with China as well as in the home market. The declaration of war in 1914 brought a great demand for home production, which reached the peak level for the whole period in 1915. But the increase in Japanese competition both in China and India brought down production in subsequent years.

As regards the different counts, we find that in 1900-01 a very large part of the yarn produced in the country was of coarse varieties, of less than 20 counts, followed by counts 21-30. The total production of yarn above 40 counts was insignificant. But whereas from year to year the production of coarse yarn was fluctuating with a decreasing tendency, the production of yarn of counts 21-30 was rising rapidly and that of counts 31-40 was also rising though not so consistently. This resulted in a fall in the share of coarse yarn from 80% in 1900-01 to 65% in 1917-18 and a rise in the share of counts 21-30 from 16 to 31%. The share of counts 31-40 fluctuated about 3% and of counts above 40 had been below 1%. Due to the high share of coarse yarn in total production, the indices of the latter

were moving in the same direction as those of the former. The gradual fall in the share of coarse yarn was brought about by the changed conditions in the trade of yarn. Formerly these varieties found a good market in China and Japan, and when that market was lost on account of the increase of local production, the mill-owners turned their attention to the home market though in competition with foreign imports in piecegoods made of yarn of medium counts.

PRODUCTION OF PIECEGOODS

The following table gives the indices of production of the different varieties and of the grand total of piecegoods as well as the shares of each in the total. Here the total weight of the goods only is taken for obvious reasons.

PRODUCTION OF PIECEGOODS

(Base: Average of 5 years 1909-1913)

Year	Indices.						Shares.					
	Chad- dars.	Dho- ties.	Shirt- ing.	T. cloth. cloth.	Colo- ured.	To- tal.	1	2	3	4	5	Other
	1	2	3	4	5							
1900	43	33	47	42	27	38	9.5	18.6	31.8	13.5	16.3	10.3
1901	59	41	54	59	33	46	10.7	18.8	29.7	15.5	16.4	8.9
1902	64	42	51	57	38	47	11.3	18.9	27.6	14.6	18.6	9.0
1903	65	48	59	61	39	53	10.1	19.3	28.4	13.8	16.9	11.5
1904	66	53	70	67	43	61	9.0	18.3	29.2	13.2	16.1	14.2
1905	67	57	66	86	48	63	8.9	19.3	26.6	16.4	17.3	11.6
1906	74	66	61	80	48	64	9.6	22.1	25.5	15.1	17.2	10.5
1907	69	87	73	87	52	73	7.9	25.6	25.4	13.5	16.5	11.1
1908	61	84	73	84	59	75	6.9	24.2	25.3	13.6	18.2	11.8
1909	82	90	87	99	80	87	7.8	21.9	25.7	13.5	20.9	10.6
1910	88	93	101	99	87	94	7.8	20.9	27.1	12.6	21.1	11.5
1911	104	102	108	101	100	103	8.5	21.1	26.8	11.8	22.3	9.5
1912	116	109	104	106	121	110	8.8	21.1	24.1	11.7	25.2	9.1
1913	109	107	100	95	116	105	8.6	21.6	24.3	10.9	25.1	9.5
1914	105	104	114	99	103	103	8.2	20.7	27.3	11.1	22.0	10.7
1915	120	126	151	114	137	130	7.4	19.9	28.4	10.2	23.2	10.9
1916	101	120	148	148	165	143	5.8	17.6	25.9	12.3	26.0	12.4
1917	82	127	150	100	180	146	4.7	18.4	26.0	8.2	28.0	15.6
1918	60	140	130	79	144	131	3.7	22.2	24.6	7.0	24.5	18.0

It will be noticed that the production of piecegoods in the beginning of this century was only 40% of the pre-war level as compared with 90% in

yarn. But from year to year the production increased rapidly crossing the base level in 1911 and coming to nearly 50% above it in 1917. The subsequent year recorded a fall due to the revival of imports after the close of the great war of 1914-18. It has already been pointed out that the loss of trade in yarn with China impelled the mill-owners to instal looms in the mills and increase production of piecegoods for the local market. This movement received special impetus during the war. In fact during the first 17 years, the production of piecegoods increased fourfold.

Turning our attention to the varieties, we notice that in the beginning, shirting and dhoties constituted between themselves nearly 50% of the total production. Coloured goods came next with a sixth of the total followed by the T. cloth which was responsible for an eighth. In 1901 the indices of production of dhoties, shirting, chaddars and T. cloth were between 40 and 59 of the base period level, and of coloured goods 33. Up to 1915 the production of all varieties of goods recorded increase from year to year. In subsequent years while the production of dhoties, shirting and coloured goods continued at a high level production of chaddars and T. cloth declined to much below the pre-war level. It is also to be noted that the competition of imports in 1918 affected shirtings and coloured goods, which marked a decline in production compared with the previous year, whereas dhoties marked further increase in production. The fall in the production of chaddars and T. cloth and the greater rate of increase of coloured goods and dhoties than shirting is reflected in the change in their shares at the end of the period compared with the beginning. The share of shirting came down from 32 to 25, of chaddars from 10 to 4, of T. cloth from 14 to 7 while that of dhoties increased from 19 to 22 and of coloured goods from 16 to 25. The miscellaneous section also increased its share from 14 to 18. Thus by the end of the war coloured goods and shirting were standing first with a quarter of the total production to the credit of each, followed by dhoties contributing more than a fifth. These three are the chief items of production with more than 70% to their credit.

POST-WAR PERIOD
MILLS, SPINDLES & LOOMS
(Base: Average of 5 years 1909-1913)

Year ¹	Index of mills	Index of spindles	Index of looms	No. of spindles per loom
1919	105	109	134	57
1920	107	111	139	55
1921	108	118	151	54
1922	122	122	159	54
1923	119	127	165	54
1924	120	131	167	54
1925	117	133	172	54
1926	120	137	174	53

1. Official year April to March.

Year	Index of mills	Index of spindles	Index of looms	No. of spindles per loom
1927	122	136	179	52
1928	128	138	187	51
1929	131	142	193	51
1930	136	144	192	51
1931	137	147	197	52
1932	135	144	195	51
1933	139	143	199	50
1934	146	147	210	48
1935	152	151	214	49
1936	161	158	222	49

All the three indices recorded a sudden expansion in 1921 and 1922 as a result of the post-war boom in the industry. The mill-owners made enormous profits during the post-war triennium and when they could obtain machinery after the reconstruction in Europe, they extended the plants to increase production. But this prosperity was short-lived and the renewal of imports brought stagnation in the industry, which is reflected in the indices in the subsequent years. But the Tariff Board enquiry of 1926 brought fresh hopes, and the increased revenue and protective duties after 1930 stimulated further increase in the mills as well as spindles and looms. The average number of spindles per loom has reached more or less a steady level, the rate of fall being much less than in the previous period.

POST-WAR PERIOD

(Base as before)

Year (Official)	Production of yarn.				% Shares of				
	1-20	21-30	31-40	Total.	1-20	21-30	31-40	Above 40.	Waste.
1919	90	125	91	986	7.8	28.9	2.7	0.5	0.1
1920	93	136	81	102	67.2	30.2	2.3	0.3	0.5
1921	98	139	90	108	67.8	29.3	2.4	0.4	0.1
1922	100	143	85	109	67.8	29.6	2.3	0.3	—
1923	86	124	105	96	66.8	29.4	3.2	0.5	0.1
1924	98	153	104	111	65.3	31.1	2.7	0.8	0.1
1925	93	146	105	106	64.9	31.2	2.9	0.9	0.1
1926	108	170	148	125	63.9	30.8	3.4	1.4	0.5
1927	104	180	181	125	61.2	32.5	4.2	1.4	0.7
1928	80	146	201	100	58.9	32.9	5.8	1.6	0.8
1929	103	186	246	129	59.2	32.6	5.6	1.9	

Year (Official)	Production of yarn.				% Shares of				
	1-20	21-30	31-40	Total.	1-20	21-30	31-40	Above 40.	Waste.
1930	107	178	325	134	59.2	29.9	7.0	3.2	0.7
1931	117	201	380	149	58.2	30.4	7.4	3.5	0.5
1932	125	212	413	157	59.0	29.3	7.6	3.6	0.5
1933	115	174	405	143	59.4	27.7	8.2	4.1	0.6
1934	120	193	511	156	57.3	28.2	9.6	4.4	0.5
1935	124	197	599	164	56.2	27.2	10.6	5.8	0.2
1936	124	154	658	163	56.1	25.5	11.7	5.9	0.8
1937	127	207	815	164	52.4	26.1	13.1	7.3	1.1

The above table shows that the total production of yarn was increasing and that this increase showed a sudden jump first in 1926 and later in 1930. But the fortunes of coarse yarn were not even; in fact till 1926 its production was always below the pre-war level, though it recovered later. Counts 21-30 also recorded steady increase in production but the greatest increase was noted in counts above 30 after 1926. Consequently the share of coarse yarn was coming down, and by the end of the period it was slightly over 50%. The share of counts 21-30 recorded upward trend only up to 1930; since then there had been a falling tendency in this section also. But from 1926 onwards and specially after 1930 the shares of 31-40 and above 40 counts were increasing at a fairly rapid rate. The phenomena can be explained very easily. After the post-war boom, the cotton industry suffered a serious set-back and spurred by a great deal of agitation, the Government appointed a Tariff Board to enquire into the condition of the industry, and also first suspended and later cancelled the excise duty on piecegoods which was in force for over 30 years. Though the Government did not give any protection to piecegoods, a small duty was imposed on the imports of yarn. The heavy fall in production in 1928 was due to the prolonged strike in Bombay, which is the premier producing centre in the country. Later the enhancement of revenue duties, the civil disobedience movement which stirred national feeling against the purchase of foreign goods, and the protection granted to the industry as a result of the recommendations of the Indian Tariff Board on Cotton Industry of 1932 helped to stimulate the indigenous industry. But in these later years, more attention was paid to the production of fine yarn and this resulted in a fall in the share of coarse and the medium counts, though absolutely the output of these varieties also was increasing. After the appointment of the first Tariff Board on Cotton Industry the production of yarn of counts 31-40 increased three times and the share of counts over 30 increased from 4 in 1925 to over 20 in 1937-38.

The following table gives the indices of production of different varieties of piecegoods and the total as also the shares of different varieties in the totals.

(Base as before)

Year	Indices.						Shares.					
	(Offi- cial)	Chad- dars.	Dho- ties.	Shirt- ing.	T. Cloth- ed.	Colour- ed.	%					
	1	2	3	4	5	6	1	2	3	4	5	6
1919	107	132	152	80	172	148	6.9	19.1	26.2	7.1	26.6	15.0
1920	91	133	153	68	165	143	5.5	20.1	27.6	5.8	26.8	14.2
1921	91	174	166	61	165	157	4.9	23.9	27.4	4.8	24.5	14.5
1922	95	166	160	57	166	156	5.1	22.7	26.1	4.4	24.4	17.3
1923	93	155	151	50	182	154	5.0	21.3	25.0	3.9	26.9	17.9
1924	100	174	178	56	211	178	4.7	21.0	25.7	3.8	27.4	17.4
1925	105	199	181	55	196	177	4.9	23.7	25.8	3.7	25.1	16.8
1926	111	222	204	76	244	205	4.5	22.9	25.0	4.4	27.0	15.2
1927	119	234	213	79	249	216	5.5	22.9	25.0	4.4	26.1	16.1
1928	95	208	163	63	172	170	4.6	22.9	25.0	4.4	22.9	18.2
1929	110	284	197	76	212	205	4.2	28.0	23.2	4.2	22.4	18.0
1930	94	296	213	103	197	224	3.6	27.8	23.9	5.5	19.9	19.3
1931	98	340	266	136	233	256	3.2	28.0	26.2	6.3	20.6	15.7
1932	100	379	249	127	253	264	3.2	30.2	23.8	5.7	21.7	15.4
1933	97	340	245	117	230	248	3.3	29.0	25.1	5.6	21.3	15.7
1934	107	388	283	132	248	283	3.1	29.2	25.5	5.6	21.0	16.6
1935	109	439	276	116	255	293	3.1	30.8	24.0	5.1	20.1	16.9
1936	123	412	295	135	258	301	3.4	28.1	24.9	5.8	19.8	18.0
1937	127	411	342	153	284	332	3.2	26.4	26.2	5.5	19.6	19.1

This table shows the same tendencies as the previous one, namely, the stimulus to production in 1926 and 1930 for reasons already explained. Between the two end years of the period the total production more than doubled. But this increase was not uniform as between all varieties. The production of T. cloth was below pre-war level till 1930 and later increased rapidly. The production of chaddars also was oscillating and showed good improvement only during the last 2 years of the period. Dhoties marked the largest increase, followed by shirting and coloured goods in order. Compared with the pre-war level the production of dhoties increased fourfold and coloured goods nearly thrice; while the total production was $3 \frac{1}{3}$ times of it. During the period the changes in the rates of increase of production brought down the shares of chaddars, T. cloth and coloured goods whereas the shares of dhoties and miscellaneous improved. The share of shirtings showed a downward trend till 1930, but later recovered its position.

We may now examine the position of indigenous production in the local market, i.e., its share in the total available for consumption. As the stocks available at the end of the year are not known, the figures are only approximate. But still we can study the trends over a period of time, because the share of the stocks in the total is not likely to fluctuate very greatly

except during boom or depression periods. One important factor we have to note in this industry is, that as it was paying excise duty till 1926, the figures of production till that year refer only to those that came out of the mills after paying the duty, the stocks in the mills being excluded. After the duty was abolished the actual production in each year is known. The Tariff Board of 1926 and the subsequent Boards estimated the handloom production from the figures of yarn available for handlooms. The total cloth available for consumption is comprised of (1) net imports, (2) mill production and (3) handloom production. The exports have been inconsiderable, and they are not classified as mill or handloom products. For reasons indicated above we shall consider the trends from the beginning of the century to the end of 1925 as one period, and the rest as another.

FIRST PERIOD 1900-25

The table in Appendix gives the proportion of the three categories in the total available for consumption. Among the mill products a further sub-division is made into (1) grey and white piecegoods and (2) coloured piecegoods. The figures for years prior to 1905 were not available according to these sub-divisions. It may be noted that till 1930 the production of white piecegoods was very small, being below 1%.¹

This table shows that as the Indian mill industry progressed it had been slowly but steadily displacing the position of foreign imports in the local markets. Of course, till the great war of 1914-18, as the total consumption of cloth was increasing, the level of imports was maintained, though the share was going down. Handloom production was fluctuating within small margin. During the war the share of imports and handlooms came down, the former owing to the difficulties of the belligerent and neutral countries to export, and the latter due to the shortage of cotton yarn imports. After the war handloom production recovered its place, but the imports could not regain the former position due to the increased competition by indigenous mills, which established contacts with markets during this period. It will be noticed that this fall is noticed both in grey and white piecegoods and coloured goods. It is interesting to note that till the commencement of war the share of imports in coloured piecegoods section was higher than that in grey and white goods. The tables were turned during the war and afterwards for some time the share of imports of coloured goods was smaller than that in grey and white goods, though the difference was small. It is a well-known fact that as between these sections the share of imports of white goods was highest because they consisted of very fine varieties which were not produced to any considerable extent in the country.

SECOND PERIOD 1926-36

The abolition of excise duty and the increase in import duty tended to strengthen the competitive power of the indigenous mill industry and the trends noticed in the previous period continued till 1930. In that

1. G. S. Hardy: Report on the import tariff of cotton piecegoods and on external competition in cotton piecegoods trade, p. 27.

year there was a very heavy fall in the share of imports, and their place was mainly taken by the mill industry. The imports instead of recovering their lost position tended to lose the ground further. This fall in the share may be explained by four important factors. (1) In the first two years the trade was paralysed by the civil disobedience movement started by the Indian National Congress in 1930 and its subsidiary movement, the boycott of foreign cloth. The frequent hartals and picketing of shops selling foreign goods in important markets brought that trade to a standstill. Though these movements subsided subsequently, the markets once lost could not be easily recovered, specially when the strong appeal for home-made goods left its impress on the minds of the people. (2) During the depression the country was hit very hard, because a large part of the people depending on land had reduced incomes, as the fall in the agricultural prices was steep. With this reduced purchasing power the people could not purchase superior foreign products. (3) In 1930 and 1931 due to exigencies of budget, the Government raised the revenue duties on imports of piecegoods and later, on the recommendation of the Tariff Board, imposed protective duties also. These were responsible for keeping out foreign goods from the home market. The beneficial results of the protective duties can be understood by comparing the imports into Burma of cotton piecegoods from foreign countries paying duty and from India duty-free (as Burma was a part of India then and it was free from political turmoils).

IMPORTS

Year	Indian	Foreign	Percentage of Indian
1925-30	27	130	17
1930-31	27	105	20
1931-32	51	99	34
1932-33	48	140	26
1933-34	77	80	49
1934-35	99	80	55
1935-36	69	99	41
1936-37	83	73	53

It will be seen that in this period the fall in the imports of grey and white goods was much greater than that of the coloured. Of these grey goods were the worst sufferers. By 1936 the share of imports of grey and white goods came down to barely 15% compared with 75% in the beginning and that of coloured goods to 25% compared with 83%. It is well-known that most of the piecegoods now imported belong to the fine varieties, wherein the local mills have to work under some disadvantages. The industry cannot hope to capture the entire market for the above reasons and also due to the fact that it had come to some agreement with the United Kingdom and Japan, the chief exporters, to import a certain quantity of piecegoods in lieu of the exports of raw cotton to those countries. So any further expansion in local production must find market in increased consumption or foreign exports.

Year. ¹	Share of Indian mill and foreign in total.			Grey and white.		Coloured.	
	Foreign %	Indian %	Handloom %	Imports %	Production %	Imports %	Production %
1900	63	13	24				
1901	65	14	21				
1902	62	15	23				
1903	59	16	25				
1904	59	15	23				
1905	61	19	20				
1906	58	18	24	75.0	25.0	82.7	17.3
1907	56	18	26	74.4	25.6	81.0	19.0
1908	56	21	23	68.9	31.1	77.3	22.7
1909	57	19	24	60.9	39.1	70.7	29.3
1910	54	25	21	67.4	32.6	73.6	26.4
1911	54	26	20	67.4	32.6	70.0	30.0
1912	52	26	22	71.6	28.4	69.0	31.0
1913	57	24	19	72.7	27.3	74.0	26.0
1914	59	23	18	68.6	31.8	66.0	34.0
1915	52	25	23	61.6	38.4	50.9	49.1
1916	48	33	17	55.8	44.2	50.7	49.3
1917	49	41	10	49.7	50.3	45.6	54.4
1918	43	45	12	44.7	55.3	37.8	62.2
1919	35	44	21	42.4	57.6	30.4	69.6
1920	38	59	23	47.1	52.9	52.0	48.0
1921	36	40	23	42.3	57.7	23.7	76.3
1922	28	47	24	51.2	45.8	35.1	64.9
1923	36	39	24	63.9	36.1	40.8	59.2
1924	37	44	18	50.2	49.8	40.9	59.1
1925	37	41	21	45.4	54.6	40.4	59.6
1926	34	39	26	45.6	54.4	39.6	60.4
1927	33	44	22	46.0	54.0	42.5	57.5
1928	35	44	21	49.7	50.3	51.2	48.8
1929	39	40	21	43.6	56.4	44.4	55.6
1930	32	43	23	24.1	75.9	30.6	69.4
1931	18	54	28	18.6	81.4	24.7	75.3
1932	15	56	27	24.1	75.9	36.3	63.7
1933	20	54	26	17.8	82.2	28.3	71.7
1934	15	56	27	17.1	82.9	32.3	67.7
1935	16	59	25	17.5	82.5	30.6	69.4
1936	12	63	25	14.7	85.3	25.9	74.1

1. Official year April to March.

PROGRESS OF THE INDUSTRY

Year. ¹	Number of mills.	Number of spindles in 1000's.	Number of looms in 100's.
1900	176	4,747	394
1901	178	4,841	405
1902	181	4,947	438
1903	183	5,004	450
1904	191	5,122	495
1905	194	5,227	521
1906	199	5,270	575
1907	218	5,662	683
1908	224	5,936	745
1909	222	5,988	813
1910	217	5,944	830
1911	233	6,095	858
1912	236	6,320	925
1913	240	6,485	1,010
1914	240	6,446	1,061
1915	237	6,347	1,076
1916	238	6,466	1,121
1917	249	6,563	1,158
1918	250	6,642	1,174
1919	242	6,715	1,183
1920	245	6,846	1,235
1921	249	7,278	1,335
1922	280	7,560	1,405
1923	274	7,851	1,465
1924	275	8,094	1,486
1925	270	8,201	1,531
1926	277	8,199	1,546
1927	281	8,218	1,591
1928	294	8,496	1,667
1929	301	8,739	1,716
1930	312	8,891	1,720
1931	314	9,078	1,752
1932	311	8,854	1,733
1933	320	8,847	1,773
1934	338	9,094	1,872
1935	350	9,297	1,905
1936	370	9,731	1,978

1. Official year April to March.

A STATISTICAL STUDY

PRODUCTION OF YARN
(in millions of lbs.)

Year. ¹	1-20	21-30	31-40	Above 40	Total including Waste
1900	281.6	57.6	11.0	2.7	353
1901	486.5	72.9	12.6	0.9	573
1902	471.1	86.0	12.5	0.7	576
1903	474.5	86.8	16.5	0.9	579
1904	464.0	95.9	17.1	1.2	578
1905	558.4	105.8	15.9	0.9	681
1906	519.0	106.0	17.2	1.4	654
1907	490.1	123.2	22.0	2.7	638
1908	506.4	125.1	20.6	4.7	657
1909	488.7	119.1	15.8	3.6	627
1910	451.0	137.0	18.0	1.8	608
1911	452.5	149.4	20.2	5.2	625
1912	506.4	158.9	19.6	2.9	689
1913	492.7	167.0	19.7	2.7	683
1914	474.3	156.3	18.7	2.2	652
1915	531.5	169.7	18.6	2.0	723
1916	480.6	171.5	24.1	4.6	681
1917	446.4	183.7	24.4	5.8	661
1918	401.8	189.2	19.2	4.6	615
1919	431.2	183.6	17.0	3.5	636
1920	443.5	199.1	15.1	2.1	660
1921	470.6	203.1	16.9	2.4	694
1922	478.6	208.9	15.9	2.2	706
1923	411.9	182.0	19.6	3.3	617
1924	469.8	223.8	19.4	5.8	719
1925	444.8	213.8	19.7	5.8	686
1926	515.7	248.3	27.6	11.5	807
1927	494.8	263.1	33.8	11.2	809
1928	382.0	213.0	37.5	10.1	648
1929	493.3	271.8	46.4	15.3	834
1930	513.7	259.7	60.7	27.3	867
1931	562.1	294.0	71.1	34.0	966
1932	599.5	297.5	77.2	36.6	1016
1933	547.4	254.8	75.8	37.4	921
1934	573.2	282.3	95.5	43.9	1001
1935	594.1	287.6	112.0	58.5	1058
1936	592.1	268.8	123.0	61.9	1054
1937	607.9	302.8	152.5	85.1	1160

1. Official year April to March.

PRODUCTION OF WOVEN GOODS

(In millions of lbs.)

Year. ¹	Chaddars	Dhoties	Drills & jean	Shirting & long cloth	T. Coloured cloth	Khadi	Total
900	9.4	18.4	1.1	31.4	13.3	16.1	98.7
901	12.8	22.5	1.2	35.5	18.5	19.6	119.7
902	13.9	23.2	1.4	33.9	17.9	22.8	122.8
903	14.0	26.7	1.8	39.2	19.1	23.3	138.1
904	14.3	29.1	3.0	46.5	21.0	25.5	158.7
905	14.6	31.7	4.2	43.6	26.8	28.5	163.9
906	16.0	36.6	5.2	42.4	25.1	28.6	165.8
907	14.9	48.4	5.9	48.0	25.4	31.2	189.1
908	13.3	46.5	6.5	48.6	26.2	34.9	192.4
909	17.8	50.1	6.1	57.8	31.0	47.6	228.8
910	19.1	51.5	7.3	66.6	40.0	51.8	245.8
911	22.5	56.3	7.6	71.6	31.6	59.6	266.6
912	25.2	60.2	7.9	68.6	33.2	71.8	285.5
913	23.7	59.1	7.5	66.5	29.7	68.8	274.4
914	22.8	57.4	8.5	75.5	30.8	61.1	277.0
915	26.1	70.0	12.7	100.0	35.8	81.6	352.3
916	22.0	66.6	15.4	98.0	46.4	98.4	377.7
917	17.7	70.1	21.2	99.2	31.2	106.8	381.4
918	13.0	77.8	15.1	86.2	24.6	85.6	349.6
919	13.2	73.4	21.6	100.6	27.4	102.1	383.8
920	19.8	73.7	19.7	101.1	21.3	98.4	367.5
921	19.7	96.2	15.4	110.0	19.1	98.4	402.5
922	20.7	91.9	14.4	105.6	17.9	98.6	405.3
923	20.2	85.7	13.9	100.3	15.6	108.3	401.7
924	21.6	96.5	18.5	118.1	17.5	125.6	458.8
925	22.8	110.1	18.1	120.0	17.4	116.7	465.0
926	24.1	123.1	20.2	134.8	23.7	145.3	558.8
927	25.8	129.7	22.9	140.8	24.6	148.3	567.8
928	20.6	115.3	19.1	107.7	19.7	102.2	445.7
929	23.8	157.2	25.0	130.3	23.7	125.9	562.2
930	20.4	164.3	21.0	141.3	32.3	117.5	590.4
931	21.2	188.3	26.2	176.3	42.5	138.6	672.3
932	21.8	210.2	28.3	165.2	39.6	150.7	694.9
933	21.1	188.1	26.5	162.0	36.7	137.6	645.9
934	23.2	215.1	29.5	187.4	41.3	147.5	736.6
935	23.7	234.2	32.1	182.2	38.8	152.9	761.4
936	26.7	219.8	35.8	194.9	45.2	154.7	782.3
937	27.6	227.9	39.3	226.1	48.0	169.2	864.2

1. Official year April to March.

THE JUTE INDUSTRY

The jute industry in India is localised in the Bengal Province, which is the monopolistic producer of this fibre in the whole world. This was flourishing as a cottage industry, specially in the eastern districts of lower Bengal till the middle of the last century. Exports of raw jute to the United Kingdom came to prominence during the Crimean War, when the supplies of flax from Russia were cut short. The subsequent growth of jute manufacturing industry in Dundee increased the exports and prices of raw jute, thereby seriously handicapping the Indian handloom industry. The machine products of Dundee gradually displaced the Indian jute goods in the foreign markets. The disappearance of the handloom industry in jute, while it still holds some ground in the other textile industries, viz., cotton, silk and wool, is due largely to the fact that jute offers very little scope for turning out goods of artistic design and the standardised products like sack cloth and bags can be manufactured more cheaply by machinery. The foundations for the mill industry were laid in 1855 by George Aueand, who established the first jute mill on the banks of the River Hooghly with machinery brought from Scotland. The excellent facilities offered by this region led to a rapid growth of the mills, which incidentally hastened the extinction of the handloom industry. At the same time, it could effectively compete with the Dundee products in the European and American markets and by the beginning of the present century outstripped the older centre.

It will be convenient to divide the history of the industry during the present century into two periods, the first from 1900 to the end of the great war of 1914-18, and second starting with 1919. The tables in the Appendix show the progress of the industry with reference to the number of mills, spindles and looms. The quantity of jute consumed by the mills belonging to the Indian Jute Mills Association and the total quantity of jute goods exported each year are also given there. For convenience they are converted into index numbers, with the pre-war quinquennium (1909 to 1913) as base and given in the following table.

PROGRESS OF THE JUTE INDUSTRY

(Indices with 1909-10 to 1913-14 as base)

Year ¹	Mills.	Spindles.	Looms.	Raw Jute consumed.	Exports of bags.	Exports of cloth.	Ratio of raw jute consumed to looms.
1900	60	46	46	57	60	38	1.22
1901	60	48	48	61	68	43	1.27
1902	63	51	51	65	66	51	1.27
1903	63	54	55	69	61	57	1.25
1904	63	59	60	73	59	59	1.22
1905	65	65	66	70	69	68	1.06
1906	73	75	76	82	76	72	1.08
1907	90	81	81	87	86	81	1.07

1. Official year April to March.

PROGRESS OF THE INDUSTRIES

Year	Mills.	Spindles.	Looms.	Raw Jute consumed.	Exports of bags.	Exports of cloth.	Ratio of raw jute consumed to looms.
1908	93	88	88	86	89	79	0.98
1909	100	93	94	106	107	97	1.13
1910	96	99	99	95	106	98	0.96
1911	98	98	98	89	86	90	0.91
1912	101	102	102	106	92	105	1.04
1913	107	108	108	104	109	109	0.96
1914	117	115	115	114	117	109	0.99
1915	117	117	119	134	234	123	1.13
1916	123	119	119	131	237	127	1.10
1917	127	121	121	126	224	123	1.04
1918	127	121	119	119	172	114	1.00
1919	127	124	122	121	101	132	0.99
1920	128	126	124	130	158	139	1.05
1921	135	131	128	101	114	116	0.79
1922	143	145	142	110	102	129	0.77
1923	148	151	146	119	122	139	0.82
1924	150	154	150	131	125	150	0.87
1925	150	154	151	127	125	151	0.84
1926	155	157	152	128	132	155	0.84
1927	155	160	156	134	137	160	0.86
1928	158	160	156	140	147	162	0.90
1929	163	165	161	149	154	170	0.92
1930	167	177	184	106	128	131	0.58
1931	172	176	183	99	115	105	0.54
1932	165	174	181	101	122	104	0.55
1933	165	173	178	100	119	108	0.55
1934	167	177	183	106	125	109	0.58
1935	173	185	190	116	135	126	0.61
1936	173	188	195	140	167	176	0.72
1937	175	194	183	155	181	169	0.85

PRE-WAR PERIOD

The table below shows certain interesting features. Whereas the index number of mills in 1900 was 60 that of spindles and looms was only 46, showing that as years went on the average size of mills increased. It is also interesting to note that unlike cotton, the indices of spindles and looms have always kept together showing that the average number of spindles per loom has kept constant. This is due to the fact that all the yarn was turned into goods, whose quality did not change much during the period. At the beginning of the century there were, on an average, 900 spindles and 400 looms per mill. By the base period these figures went up

to over 1100 spindles and 500 looms, showing an increase of about 25% in the average size of the mills. It is also to be noted that the first rapid rate of increase in the number of mills occurred in the quinquennium 1905 to 1909, and it was followed by a halt for four years, and there was again rapid expansion between 1912 and 1916. There was no change in the average size of the mills during the war period.

PRODUCTION

Unfortunately the figures of production of jute goods, according to varieties are not available till 1932. But the Indian Jute Mills Association, which has a membership of over 95% of the existing mills in India, publishes the total quantity of jute consumed each year, in all the member mills based on the returns supplied by them. Though they do not give us the whole picture, they give us a fairly reliable index of the trends in production, considering the fact that the quality of the goods produced did not change materially during the period. As the industry depends on foreign markets for nearly 90% of its production, a rough idea of the trends of production of different varieties will be given from the figures of exports of the two main varieties of jute products, namely, bags and cloth. From the table we notice that the production of jute goods was increasing from year to year and doubled during the above period. During the war years 1915-17 the production was at a very high level. This was due to the increased demand for these goods from foreign countries, as will be seen from the indices of exports of bags and cloth. It is interesting to note that the number of mills more than doubled during the period. But the number of spindles and looms increased by nearly $2\frac{1}{2}$ times showing that the production per spindle and loom decreased during the period 1900 to 1918. A rough idea of the fall can be got by dividing the index of consumption of jute by the index of number of looms. In the first quinquennium, it was nearly 1.25, it fell down to about 1.06 in the next quinquennium, and was nearly 1.00 in the base period. But even in this period, it was high only in the first year and in 3 out of the 5 years it was below 1.00. The figure was over 1 during the 3 years 1915-17, as is to be expected from the war conditions. Hence comparing the beginning and the base periods, the output per spindle and loom came down by nearly 20%. The output increased during the war, but by the final year it came back to the base level. This fall may also be partly explained by the possible increase in the output of fine varieties. It should be noted that whereas the consumption of jute doubled, exports of bags and cloth trebled during the period. Also till the war period, the progress of exports of cloth was greater than that of bags¹ and it is known that the quality of yarn in cloth is finer than that in the bags.

POST-WAR PERIOD

The steady progress in all directions—number of mills, spindles, looms—was kept up till the end of 1931; and between 1919 and 1930 the

1. *Growth of Trade and Industry in Modern India* by Vakul and others, p. 171

index of spindles was throughout slightly greater than that of looms. But during the worst period of depression there was a reduction in all directions. Recovery started from 1934, the number in the final year being highest for the whole period. During this period index of looms was higher than that of spindles. Comparing the two years 1900 and 1937 we find that the number of mills increased threefold and the number of spindles and looms nearly fourfold. Thus the average size increased by nearly a third.

PRODUCTION

The total consumption of raw jute was high in the two years after the war. This was followed by a heavy fall for three years. But between 1924 and 1930 the industry was again in a prosperous condition. From 1930 to 1932 the position came back to the base period level and revival started from 1934-35. With the end of the war the exceptional demand for jute bags came down and their exports were at a low level in the four years after the war except in 1921. But from 1923, with the revival of international trade, the demand for jute goods increased and reached the high-water mark in 1929. Again during the depression there was recession and recovery started from 1934. The war clouds in Europe gave special stimulus from 1937. As regards cloth it shows the same tendencies but from 1922 to 1932 the index of cloth was throughout higher than that of bags. This was due to the fact that some factories on the continent were purchasing the cloth to manufacture bags in their own countries. During depression and the recovery period the index of cloth was again below that of bags. This can be explained by the fact that the demand for cloth increased very rapidly with the increase in the world trade and the depression affected it more seriously than the bags. The recovery in jute is partly due to the war conditions, and for that purpose bags are more needed than cloth. If we refer to the ratio of the production to looms, we find that in 1921 and 1922 there was a heavy fall and there was slight recovery between 1923 and 1930 to between 0.8 and 0.9. Again during the depression it fell to about 0.55 and during recovery came up to nearly 0.7. These heavy fluctuations cannot be explained by the changes in the quality of the products. They were due to the fact that during the post-war period, production exceeded demand, and the mills had to restrict output for varying periods. This has been systematically going on since the twenties. But in spite of it some mills were started by people outside the Association, and the higher prices maintained by the schemes of restriction made this possible.

Unlike all other large-scale industries in India which depend mainly on internal markets, and even here require protection against foreign imports, the jute industry has to find its markets in foreign countries. Instead of receiving any protection, it has to pay a levy in the form of export duties. If in spite of these handicaps the industry is flourishing, it is due to the strong localisation factors, abundant raw material near at hand, efficient management and the financial strength of the concerns. Of late, the industry has been suffering from several disabilities. After the great war of 1914-18 the production of European and American industries increased very much,

This can be seen from the consumption of jute in India and export to foreign countries.¹ This is facilitated by two factors (1) higher costs of Indian manufactures due to restriction schemes and (2) high import duties in these countries. At the same time, the demand for jute products has been reduced on account of the increased use of substitutes, the construction of elevators and bulk-handling of grains, dispensing with the use of packing materials, etc. To overcome the evil effects of overproduction, the Association mills agreed to voluntary restriction of output. In fact except for a brief period between April 1920 and December 1921, the mills were throughout working on schemes of restricted production. This tended to lessen competition in foreign markets and consequent loss of trade there, and also increased the number and output of non-Association mills. Another great handicap of the Indian jute industry is the lack of variety in the output. The mills in India are suffering from the evils of overproduction of particular varieties of goods manufactured by them. Whereas the jute mills in Central Europe, which were started much later than the Indian mills, are finding increased uses for jute as a blending material with silk and wool, no endeavour was made in India to find new uses for jute except the production of packing and hessian cloth. "Indeed the jute mill industry in Bengal has come to be condemned by some critics as the sole industry of importance today, which knows its business least."²

PROGRESS OF JUTE INDUSTRY

Year (Official)	No. of mills.	No. of spindles.	No. of looms.	Quantity of jute consumed.	Export of Bags.	Cloth.
		(000's)	(00's)	(millions of maunds.)	(000's)	(000's yards)
1900	36	317	153	12.08	203	365
1901	36	331	161	—	230	419
1902	38	352	172	13.73	225	493
1903	38	377	184	14.46	208	551
1904	38	409	200	15.38	201	576
1905	39	453	220	14.79	233	659
1906	44	521	253	17.16	258	696
1907	54	562	272	18.29	293	790
1908	56	607	295	17.97	301	770
1909	60	646	314	22.30	364	940
1910	58	683	332	19.90	361	955
1911	59	678	329	18.78	290	871
1912	61	709	340	22.17	312	1,022
1913	64	744	361	21.87	369	1,061
1914	70	796	384	24.03	398	1,057

1. *Economics of Jute*, by S. Gupta, p. 93

2. Bengal Jute Enquiry Committee Report, p. 79.

Year. ¹	No. of mills.	No. of spindles.	No. of looms.	Quantity of Jute consumed.	Export of Bags.	Export of Cloth.
1915	70	812	399	28.05	794	1,192
1916	74	824	397	27.60	805	1,231
1917	76	834	406	26.48	758	1,197
1918	76	840	400	24.98	583	1,103
1919	76	856	410	25.41	343	1,275
1920	77	870	416	27.33	534	1,353
1921	81	908	430	21.18	387	1,121
1922	86	1,003	475	23.08	347	1,254
1923	89	1,043	490	25.02	414	1,349
1924	90	1,068	503	27.59	425	1,456
1925	90	1,064	505	26.72	425	1,461
1926	93	1,084	510	26.87	449	1,503
1927	93	1,106	522	28.16	463	1,553
1928	95	1,108	524	29.40	498	1,568
1929	98	1,140	539	31.23	522	1,651
1930	100	1,225	618	22.19	434	1,271
1931	103	1,221	614	20.75	389	1,021
1932	99	1,202	605	21.23	415	1,012
1933	99	1,194	595	20.99	402	1,053
1934	100	1,222	614	22.27	423	1,063
1935	104	1,279	637	24.37	459	1,218
1936	104	1,300	653	29.47	567	1,708
1937	105	1,338	667	32.63	612	1,643

THE SUGAR INDUSTRY

The story of the sugar industry in India reads like a romance in the industrial history of the country. Though India was the birth-place of sugarcane, and small-scale indigenous production of raw sugar was prevalent for a long time, like other cottage industries it lost ground to the competition of countries which were producing refined sugar under altogether different economic conditions. By the commencement of this century, imports of white sugar gradually entered into the market and for nearly three decades remained an important item of the trade of the country and also a source of revenue to the Government. The necessity for establishing this industry in this country was, for the first time, felt during the great war of 1914-18, when imports fell short and prices went up to a great height. The scope for developing it was investigated by a committee under the chairmanship of Mr. J. McKenna which produced a valuable report stressing the importance of the industry in the national economy of the country. Unfortunately this report received the same

1 Year from April to March

fate as that of many other reports, in being shelved without any action. But the high revenue duties levied during the post-war period afforded shelter to some small concerns producing sugar by indigenous process known as 'khandasari' and also encouraged the establishment of a few factories of small size, here and there in the interior. But no systematic efforts were made by the Government to stimulate the development of the industry, and industrialists could not depend on revenue import duty, however high it may be, as it was liable to alteration at short notice. This state of affairs continued till 1929, when the Sugar Sub-committee of the Imperial Council of Agricultural Research interested itself in the matter and made representations to the Government about the urgent necessity for appointing a Tariff Board to investigate the desirability of converting the revenue duties into protective ones. The Tariff Board, which was appointed in 1930, submitted its report in 1931 recommending protection for a period of 15 years and the Government passed the necessary legislation in 1932. This resulted in a phenomenal expansion of the industry within a short time.

In the following pages, the progress of the industry during the post-war period only will be traced. The main methods of production are : (1) direct from cane, (2) refinement from gur, and (3) khandasari. As accurate statistics are not available for the third, production of sugar by the first two methods only is considered here. Though the last method was very important in the earlier years, with the development of factory production on a large scale, it receded to the background. It is convenient to study the development in two periods : (1) pre-protection period ending with 1931-32, and (2) post-protection period. The figures of production by each method and total are given in the following table. For convenience of study we may convert the figures of production into index numbers, with the period 1925-26 to 1930-31 as base, because the real development of the industry started with the imposition of very heavy revenue duties in 1930-31. The following table gives the details of the number of factories and the amount of production by the two methods as well as the share of each in the total.

TABLE I

Year. ¹	Cane factories.	Gur refineries.	Total.	Index of produc- tion. Base : 1925-30	Share of cane sugar. %	Im- ports.	% of local produc- tion to total.
	Produc- No. tion	Produc- No. tion	Produc- No. tion.				
	000 tons.	000 tons.	000 tons.			000 tons.	
1920	23.3	44.5	67.8	63	34	482	12
1921	24.6	48.5	73.1	67	34	344	18
1922	27.6	47.8	75.4	69	37	783	9
1923	23.9	50.2	74.1	68	32	504	13
1924	38.3	56.4	94.7	87	40	475	17
1925	33.8	33.6	67.4	62	50	728	8
1926	53.0	38.4	91.4	84	58	803	10
1927	25 62.9	22 58.1	47 121.0	112	52	923	11
1928	26 67.7	19 52.1	45 119.8	110	57	823	13
1929	24 68.1	14 31.0	38 99.1	91	69	937	10
1930	27 89.8	11 21.2	38 111.0	102	81	1011	10
1931	29 119.9	10 31.8	39 151.7	140	79	1003	13
	32 158.6	17 69.5	49 228.1	210	70	556	29

This table shows that at the beginning of the period the quantity of production was about 3/4 of the base period, and with the gradual increase of the revenue duties the local production was stimulated. Till the end of 1922-23 refining of gur was more important than production direct from cane which was contributing only about a third to the total. But from 1924-25, it gradually gained ground, and surpassed the former in 1925-26, reaching nearly 80% by the end of the period. The fall in its share noticed in the final year was caused by the sudden rise of refineries after the increase of revenue duties in that year. During the whole period the total production was increasing due to the expansion of factories using cane directly, and the fall in the production in the years 1925, 1926 and 1928 was due to the fall in the refining factories on account of the high price of gur. But the heavy duties of 1930 and 1931 stimulated both types. From the last column of the table we find that previous to 1931 indigenous production was about 11% of the total available for consumption, this share varying between 8 and 18. In the last year the share of production increased to 29% due to the installation of a number of factories behind the wall of high revenue duties and expectation of protective duties.

POST-PROTECTION PERIOD

TABLE II

Year. ¹	Direct from cane.		Sugar refineries.		Total.		Index.	Share of direct from cane.	Im-ports.	% of produc-tion to total
	No.	Produc-tion.	No.	Produc-tion.	No.	Produc-tion.				
1932	57	290.2	27	80.1	84	370.3	341	78	402	48
1933	112	454.0	16	61.1	128	515.0	475	88	264	66
1934	130	578.1	13	39.1	143	617.2	569	94	223	73
1935	137	932.1	13	50.1	150	982.2	905	95	201	83
1936	137	1120.4	9	19.5	146	1130.9	1042	98	23	98
1937	136	930.7	10	16.6	146	947.3	873	98	14	98

The beneficial results of protection are apparent from 1933-34 only, as it took some time to set up new factories. In this year the number of factories working was double that of the previous year. The production of sugar in 1932-33 was nearly $3\frac{1}{2}$ times the base period and increased year by year till it reached the maximum in 1936-37 when it was about 11 times the base level. This rapid rate of increase in production resulted in a heavy fall of imports which came down to a low level of 14 thousand tons in 1937-38. The share of indigenous production increased from 29% in the year previous to protection to 48% in the first year and 98% by 1936-37. The Government were concerned at the loss of their import revenue and to compensate this loss and check any unhealthy growth of inefficient factories they levied an excise duty in March, 1934. Though it checked the establishment of new factories, it led to an expansion of the existing ones which attempted to compensate the loss from the new duties by spreading the overhead charges over a larger volume. The benefits of protection were reaped by cane-sugar factories only and gur refineries dwindled both in number and in the amount of production, as the wasteful methods of production involved increase in cost. The fall in production in 1937-38 was partly due to over-production in the previous year and partly to failure of the crop in the United Provinces in that year. Thus during a short period of ten years the industry expanded tremendously—much beyond the expectations of the Government and the industrialists.

Efficiency of the industry:—The efficiency of the industry in reducing the costs of manufacture depends to a considerable extent on the duration of the cane-crushing season and the percentage recovery of sugar from the cane.

Duration of the season —“The duration of a season is dependent on the availability of raw material and the economic operating purity of the cane supplies.”² The following table gives the duration of the season in the post-protection period in important regions of India.³

1. Year from April to March

2. Report of the Indian Tariff Board on Sugar Industry 1938, p. 62.

3. Ibid., p. 61.

DURATION OF SEASON

(number of days)

Region.	1932-33.	1933-34.	1934-35.	1935-36.	1936-37.
Punjab.	134	89	93	116	142
West U. P.	146	119	131	145	171
Central U. P.	145	154	143	165	138
East U. P.	173	144	139	163	160
North Bihar	181	148	129	149	176
South „	170	122	142	139	161
Bengal.	...	138	131	165	156
Madras.	143	95	88	125	123
Bombay & Baroda.	206	121	217	192	186
Mysore.	...	229	197	279	279

According to the calculations of the Tariff Board the average crushing season for the sub-tropical regions was 129, 150 and 163 days respectively in 1934-35, 1935-36 and 1936-37, as against 148, 161 and 158 for the tropical regions, the average for the whole of India for the triennium being 150 days. It will be noticed that the duration of the season in Bombay and Mysore was very high. The harvests of 1936-37 were exceptionally long in the United Provinces and Bihar mainly due to the low prices of cane, which was suitable for crushing in respect of sucrose content and high purity of juice due to the favourable climatic conditions. The season can be prolonged by cultivation of both early and late varieties of cane. But the present early varieties are found unsatisfactory, because they deteriorate very rapidly. It was found that the later varieties suffered more from diseases, and there was also loss due to dryage of the cane. Hence there is urgent need for discovering suitable varieties to overcome the above difficulties. One other disadvantage of prolonging the season is that the cultivator cannot grow a second crop in that year. It must also be noted that the duration of season is different from the average working days of the factory. The average working days during the three years noted above were 108, 128 and 139 respectively for sub-tropical and 122, 135 and 132 for tropical regions. The average for All-India in the triennium was 130 days, i.e., the actual working days were less by 20 in 150 days, i.e., by about 13%.

RECOVERY OF SUGAR

The recovery of sugar depends mainly on the quality of the cane and it will be heavily reduced if the crop is attacked by diseases and pests. It was found that the average yield and the sucrose content of cane cultivated in factory-owned land or in Government agricultural farms were higher than those grown by ordinary cultivators, due to the greater care taken in manuring, supplying water and prompt measures taken to check diseases and pests.¹ The meagre resources of an ordinary cultivator do not permit him to invest money on better methods of cultivation. The following table

1. Vide Tariff Board Report on Sugar Industry, 1938, p. 67.

gives the distribution of factories according to recovery. The figures are taken from the supplements to the *Indian Trade Journal*.

Recovery %	1934-35.	1935-36.	1936-37.	1937-38.
Below 8	38	18	14	24
8 and below 9	47	51	31	22
9 and above	45	68	95	90
	<hr/>	<hr/>	<hr/>	<hr/>
	130	137	140	136

For 1936-37 and 1937-38, we have got a more detailed table as given below.¹

Recovery %	1937-38			1936-37		
	United Provinces.	Bihar.	All-India	United Provinces	Bihar.	All-India.
11.0 & above.	...	...	5	...	...	2
10.5... 10.9	13	...	13	...	1	5
10.0... 10.4	8	6	16	14	...	16
9.5... 9.9	13	11	27	26	4	35
9.0... 9.4	9	15	29	17	16	35
8.5... 8.9	8	...	13	8	12	23
8.0... 8.4	2	...	6	3	...	8
7.5... 7.9	6	...	7	...	...	6
7.0... 7.4	4	1	9	...	...	2
6.0... 6.9	5	...	7	...	...	5
5.0... 5.9	...	...	1	...	...	...
Total.	68	33	133	68	33	137

From the first table we notice that the percentage of factories with recovery below 8% came down from 29 in 1934-35 to 10 in 1936-37; recovery 8-9% from 36 to 22 whereas in the same period the percentage of those with recovery above 9% increased from 35 to 68. From the second table we notice that in 1936-37 all factories with very high recoveries were outside the United Provinces and Bihar and that the range of variation was smallest for Bihar and next came the United Provinces. Though the quality of cane in 1937-38 deteriorated, the average recovery of all factories in Bihar and some in the United Provinces improved. But the recovery of factories in other parts of India showed great variation from so low a figure as about 5% to the highest above 11%.

The following table gives the maximum, minimum and average recovery for the three regions noted above, in the post-protection period.

^{*} 1 Review of the Sugar Industry of India, 1937-38, Supplement to the *Indian Trade Journal*, p 7

Year. ¹	Maximum.			Minimum.			Average.			
	U.P.	Bihar.	India.	U.P.	Bihar.	India.	U.P.	Bihar.	India.	Java.
1933	10.27	10.00	10.98	6.60	5.50	4.38	9.08	8.32	8.80	12.64
1934	10.44	9.74	11.10	5.45	6.93	5.00	8.56	8.79	8.66	12.35
1935	10.60	10.06	11.34	7.45	6.60	6.59	9.60	8.93	9.29	13.21
1936	10.49	10.55	11.43	8.36	8.52	6.06	9.65	9.20	9.50	11.72

The gradual increase, in all the regions, of the average, minimum and maximum recovery can be noticed; and the increase in the second was greater than that in the third. Thus we see that the improvement in average recovery was mainly contributed by the increased recovery in a large number of inefficient mills. But it must be noted that even the maximum recovery in India is less than the average recovery in Java. Hence unless efforts are made to increase the maximum also to a greater extent, the country will not be able to stand foreign competition without tariff protection. The Indian Sugar Mills Association are of opinion that unless intensive research is carried out with regard to resistance to insect pests and diseases which reduce the sucrose content of the cane by as much as 42%, in some areas, no great improvement in the recovery rate can be expected.²

In addition to the prolongation of the season and improvement in recovery, efforts should be continued to increase the average yield per acre. Though great strides were made in this direction, and the percentage area under improved varieties of cane is high, and also exceptional yields are got in particular places like Deccan Canal region in Bombay,³ the average yield per acre is still smaller than in other sugarcane-growing countries. Another handicap to the industry is the general absence of control of factories over the supply of raw material, except in some regions. This had often proved to be a handicap in some places where differences arose between the growers and factories. The wide areas under the control of factories are pointed out to be partly responsible for the efficiency of the industry in Java and Cuba.

BY-PRODUCTS

The economic disposal of by-products, molasses and bagasse, is one of the most urgent problems facing the industry at present. The large increase in the production of molasses brought down the prices to very low levels; and the present surplus of this commodity is estimated at 200 to 250 thousands of tons per annum. It is therefore imperative that some profitable use should be found so that this asset of great value may not be wasted. Various investigations have been carried on to find uses for it as fertiliser, road surfacing material, cattle feed, etc. But its most important use is in the manufacture of power alcohol, because molasses is the cheapest and best raw material. But this subsidiary industry cannot be developed without the sympathy and active help of the Government, by way of issuing licenses for its manu-

1. Year from April to March.

2. Vide Indian Tariff Board Report on Sugar Industry, 1938, pp. 67-68.

3. In an experimental plot 100 tons of cane per acre was obtained. Ibid., p. 67.

facture and making it obligatory on the fuel oil sellers to mix it in a fixed proportion with petrol. Even though it may result in a loss of revenue to the Government, the great importance of this industry, which has been successfully adopted in many Western countries, should be noted by them. The Indian Tariff Board on Sugar Industry, 1938, strongly recommended this course.¹

At present the bagasse—the fibrous residue after cane is crushed—is used as fuel in the factories. But if some other profitable use can be found for it, the factories, especially those near coal mines and ports, may use coal or oil as fuel economically. The bagasse is used in foreign countries chiefly in the manufacture of paper boards, packing paper, etc. Other possible uses are in the manufacture of cellulose, artificial silk, and also glass. But more researches have to be carried out before these can be brought on a commercial scale. Unless some return is got for these by-products the price of sugar cannot be brought down.

THE IRON AND STEEL INDUSTRY

There is ample evidence to show that iron smelting was at one time a widespread industry in India; and the metallurgical skill of the earlier generations was world-famous. Some attempts were made during the 19th century to introduce the modern processes for the manufacture of pig-iron and steel in India. The premier worker in this field was Mr. J. M. Heath of the Madras Civil Service who became a martyr in the cause of this industry. He started his work in the North Arcot district in Madras in 1830 and, in spite of various concessions and financial help, failed. The Porto Novo P. & S. Company which took over this business in 1833 and the East India Co., started in 1853, had the same fate. Futile attempts were made in Chota Nagpur and some other places also. Barakar Iron Works, now known as the Bengal Iron and Steel Works, founded in 1825, passed through various vicissitudes before it was taken over by the present management and led to success. Even this company had been producing only pig-iron, and its attempts to produce steel in 1903 ended in heavy losses. The modern era of steel industry in India began with the valiant efforts of late Mr. J. N. Tata (Sir) who in the face of immense difficulties, at first in prospecting the ore and later in raising the required capital, laid the foundations of this key industry. The Tata Iron and Steel Works named after the illustrious founder are situated at Sakehi (now known as Tatanagar or Jamshedpur) in the Singhbhum district of Bihar Province. The construction of works was started in 1908, the first blast furnace was blown in December, 1911, and the manufacture of steel started in 1912. At first considerable difficulties were experienced in connection with the manufacture of steel; but these were overcome and the great war of 1914-18 came as a boon to check the competition of imports as also to provide a wide market for its products. Immediately after the war, several companies were floated, but the two that have continued to work are the Indian Iron and Steel Company and the Mysore Iron Works, the former manufacturing pig-iron only and the latter both iron and steel. But the capacity of Mysore Works is very small and it passed through anxious time

1. Vide Indian Tariff Board Report on Sugar Industry, 1938, pp. 111-12.

till it was completely renovated and is now yielding some return. Till the recent war the Tatas was the only major steel manufacturing concern, the capacity of Mysore Works and the few re-rolling mills started in the United Provinces and Madras being very small. But recently the Bengal Iron Works and the Indian Iron and Steel Works were amalgamated with a view to manufacturing steel. Thus the history of the steel industry in India up to now is the history of the Tatas. In the following pages the progress of the iron and steel industry will be traced, in the two periods, pre-war (1900-13) and war and post-war (1914-38). In the former period pig-iron only was manufactured: the total production of finished steel by Tatas till the end of 1913 was only about 40 thousand tons.

PRE-WAR

Year.	Pig-iron Production. (000 tons)
1900	35
1901	35
1902	35
1903	35
1904	41
1905	45
1906	47
1907	39
1908	38
1909	39
1910	36
1911	49
1912	59
1913	59

During this period the Bengal Iron and Steel Works was the only concern manufacturing pig-iron. The Tatas came in by the end of 1911 and in the first two years produced 232 thousands of tons of pig-iron. The above figures relate to the former company only. During the first decade production was about 40,000 tons. But in the last three years of the period it increased rapidly by nearly 50%.

POST-WAR (INCLUDING WAR)

The following table gives the indices of production of pig-iron—total as well as Tatas separately—with the average for the 4 years 1919 to 1922 as base. It also gives the indices of exports of pig-iron. The share of the production of the Tatas and of exports in the total production are also given.

Base :— 4 yrs. 1919 to 1922

Year.	Indices of pig-iron pro- duction.		Share of Tatas in total.	Indices of Exports.	Shares of exports in pro- duction.	Indices of steel.
	Tatas.	Total.				
1914	67	71	68.9	92	22.9	55
1915	64	74	64.1	117	31.6	63
1916	63	74	62.5	193	46.0	77
1917	70	75	67.8	116	27.3	94
1918	82	75	80.2	8	1.8	107
1919	96	96	73.2	66	12.2	111
1920	92	95	71.4	76	14.3	94
1921	117	112	76.6	89	14.1	104
1922	95	97	71.3	169	30.8	92
1923	163	179	66.4	311	30.8	125
1924	224	265	61.9	464	30.4	204
1925	234	268	64.0	688	45.6	264
1926	253	280	66.2	540	34.9	298
1927	259	347	54.7	658	33.7	355
1928	212	320	48.6	733	42.6	228
1929	300	423	51.9	938	39.5	340
1930	289	357	59.2	860	42.8	359
1931	332	322	75.6	546	30.1	372
1932	290	278	76.7	425	27.2	353
1933	329	322	75.1	637	27.9	439
1934	366	401	66.8	682	30.1	499
1935	373	441	61.9	809	32.6	534
1936	356	468	55.7	1038	39.3	551
1937	367	493	54.6	1022	36.8	545

The above table shows that the total production of pig-iron during the war was about 3/4 of the base period level; but in the post-war period, it increased very rapidly reaching the high-water mark in 1929 when it was more than 4 times the base period level. During the depression of 1930, there was a setback reaching the bottom in 1932; but since then there had been a revival, the figure of 1937 being the record for the whole period with production nearly five times that of the base period and seven times of 1914. Though the production of the Tatas also was following the same course, its fluctuations were less violent. This was due to the fact that whereas a very large part of Tatas pig-iron was used in its steel furnaces the other companies were manufacturing for export. The result of this is seen in the share of the Tatas in the total production which would be found to be very high when foreign demand was low and vice versa. At the beginning the Tatas were producing about 2/3 of the total and in the twenties when

exports were high the share came down to between 50 and 60%. The very low figure of 49% in 1928 was due to the prolonged strikes in the Tatas in that year. During the depression when exports were very low, the Tatas share again went up, and there was a fall with the revival of exports. From the column of the index number of exports, it will be noticed that they increased very rapidly in the twenties of this century, reaching the maximum in 1929 and then came down during the depression. But from 1935 there had been an upward swing and the level at the end of the period was about 10 times that of the base period

STEEL

Turning our attention to steel we find that this industry had been showing steady progress without any setback even during depression. The fall noticed in 1928 was, as has already been pointed out, due to the prolonged strikes. The level of production at the end of the period was over 5 times that of the base period. It will be interesting to study the trends of production of the different varieties of steel manufacture. The following table gives the details of production of the Tatas who are the premier producers in the country.

TABLE II

	('000 tons)												
	1926	27	28	29	30	31	32	33	34	35	36	37	38
Rails	144	174	89	136	112	47	38	35	79	65	86	77	94
Fish-plates	4	7	4	4	6	2	2	2	3	3	3	4	4
Structures	36	52	39	63	83	103	100	132	136	155	134	127	147
Bars	91	72	49	80	77	93	93	107	125	131	132	195	197
Plates	20	26	21	32	35	23	29	49	34	46	50	65	65
Black sheets	6	19	11	21	23	24	13	25	21	40	29	27	26
Galvanized sheets	12	9	11	18	27	29	47	59	72	75	92	81	95
Sleepers	...	4	1	8	2	.	8	4	14	16	15	9	16
Tin Bars	51	65	52	48	57	65	53	62	71	69	72	80	57
Miscellaneous	...	1	..	2	12	64	59	76	72	77	79	209	234
Total	364	429	277	412	434	450	442	551	627	677	692	874	935

From the above table we notice that in earlier years the Tatas were manufacturing mainly rails and fish-plates for supplying to the railways, and the share of other sections was very little. But as years went on there was greater diversification in production, and the manufacture of structural sections, plates, black and galvanized sheets came to prominence. The heavy fall in the production of rails and fish-plates during the depression was mainly due to the fall in demand from railways and even the level of manufacture in 1938 was much below the pre-depression level. The company was supplying a good deal of material for constructional purposes.

So far Tatas have been the chief producers of steel in India, the capacity of the Mysore factory, which passed through several vicissitudes, being small. Though there are some re-rolling mills at Calcutta, Benares, Ghaziabad, Cawnpore, Lahore and Negapatam, they are all very small, inexperienced and for the most part ill-equipped. They re-roll scrap material and manufacture bars, plates, etc., which are not of very high quality. They are able to stand in the market in spite of very high costs of production, because their overhead charges are small. As has been pointed out by the Indian Tariff Board on Steel Industry, 1934, it must be recognised "that the growth of a re-rolling section of the industry, capable of dealing with small orders, even of steel products which may compete with the output of the main steel producing works, will be a natural and desirable outcome of the present tendency."¹ These small units can strengthen themselves only by better organization, by specialisation and by capturing markets in areas favoured by freight charges.

The demand for steel and its products had been growing from the beginning of this century, and there is a wide category of steel goods, which are not covered by tariff protection. There are reasonable prospects for the extension and the use of steel in India, viz., in industries like railway engine building, ship-building, motor and aeroplane manufacturing, etc. The Indian Tariff Board on Steel Industry, 1934, expressed the view that there was room for another steel works and that the success of the Tata Company should be sufficient to encourage the establishment of another. The same Board pointed out that it was greatly to be desired that steel production should not remain the monopoly of a single enterprise.² After the report, the Bengal Iron and Steel Works and Indian Iron and Steel Works were amalgamated forming a new company for the production of steel, which came into operation in 1940. There were protracted negotiations between the Tatas and this company to come to some agreement as regards the margin of interest and production, but they failed. Whether the production of these two big concerns will be complementary or competitive, is not known at present. The present war created a great demand for all the products. But whether new channels can be found in future for the increased output, or whether there will be a post-war depression in the industry, as happened after the previous war, depends on the policy of the Government and the industrialists.

We may now examine the progress made by the industry in capturing the local market. The following table gives the share of dispatches of different varieties of steel products from the Tata Iron and Steel Company in the total of imports and the Company's dispatches in the decade 1923-24 to 1932-33.

1. Vide Indian Tariff Board Report on Steel Industry, 1934, p. 14.
2. *Ibid.*, p. 18.

% Share in total

	1923 -24	1924 -25	1925 -26	1926 -27	1927 -28	1928 -29	1929 -30	1930 -31	1931 -32	1932 -33
Rails and Fish-plates.	48.4	87.3	73.8	88.1	55.7	64.2	81.9	92.9	94.6	98.5
Structural sections.	15.5	22.7	25.2	28.8	18.9	15.8	27.0	38.3	59.7	79.6
Bars.	10.0	20.5	34.0	33.6	33.8	31.7	41.8	59.9	74.2	82.2
Plates.	3.8	23.4	38.2	46.3	37.9	30.0	47.1	61.6	75.2	84.6
Black sheets.	..	4.4	22.5	28.9	31.7	29.2	44.0	52.5	61.4	48.4
Galvanised sheets.	...	0.9	4.0	4.5	2.7	2.9	5.8	12.0	27.2	37.2
Tin Bars.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total.	17.9	28.8	31.8	37.9	31.2	25.5	38.6	53.4	64.8	72.9

This table shows the tremendous progress made by the industry during the decade. From barely 18% in 1923-24 the share of the Tatas in the total protected steel (imports and production) available for consumption shot up to nearly 73% in 1932-33, and the progress was greatest during the world depression period starting with 1930-31. Except in black and galvanised sheets, in all other protected varieties the country became nearly self-sufficient. But still there were some varieties for which protection was not granted due to the failure to comply with the conditions for protection laid down by the Fiscal Commission.

From the data available in Government publications it is not possible to make a similar estimate for the succeeding years. But a good idea of the trends can be got from the following tables giving (1) the dispatches from the Tatas, (2) the imports of steel and iron and steel products and (3) the total imports of protected steel and iron and steel products and manufactures of saleable steel in India.¹

TABLE I
TATAS DISPATCHES OF STEEL (000 tons.)

	1933-34.	1934-35.	1935-36.	1936-37.
Rails and fish plates.	40	76	82	88
Bars and light structures	155	175	185	182
Heavy structures	98	88	97	82
Plates.	48	39	46	49
Black Sheets.	17	21	29	28
Galvanized Sheets	60	73	77	90
Tin bars	61	75	71	70
Sleeper Bars and sleepers.	5	22	19	23
Blooms, Billets and Sheet Bars.	65	44	45	60
Total.	539	613	651	672

1. Vide Indian Tariff Board Report on the Steel Industry, Evidence, Vol I, p. 57

TABLE II
IMPORTS OF DIFFERENT VARIETIES OF STEEL

	1932-33	1933-34	1934-35	1935-36	1936-37
Steel angle and Tee.	11.8	11.4	13.8	19.4	14.9
Bars and beams.	69.2	66.1	62.6	54.5	27.5
Girders and bridges.	15.7	19.2	22.3	28.7	24.9
Bolts and nuts.	6.5	7.6	10.2	12.6	9.4
Fencing materials.	4.5	5.7	7.3	8.8	7.8
Hoops and strips.	24.3	28.1	34.5	46.9	41.2
Nails.	10.5	10.6	12.2	15.9	12.3
Galvanized sheets & plates.	72.7	60.8	58.8	73.2	64.6
Sheets & plates not galvanized	22.1	23.7	31.4	37.4	26.5
Tinned sheets and plates.	7.0	7.4	5.6	6.5	1.4
Rails, chains & fish-plates.	1.7	3.0	5.3	7.9	10.0
Tubes and pipes.	23.5	29.0	34.9	62.1	40.4
Wire nails.	13.2	11.9	15.7	15.3	8.0
Wire rope.	2.0	2.3	3.2	3.0	3.4
Cast Pipes.	2.1	3.4	1.6	1.4	1.4
Sleepers.	2.4	2.9	4.3	4.5	4.6
Total imports.	324	223	364	446	360

TABLE III

	1933-34	1934-35	1935-36	1936-37
Imports of protected steel.	195	187	219	286
Production.	531	604	646	667
Percentage of production to total.	73	76	75	70

From table I we find that the Tatas were either maintaining or increasing production of those categories in which they were holding a predominant position in previous years and increased the production of black and galvanized sheets by nearly 58%. From table II we find that the imports of those sections in which Tatas were strong had not increased, and while they increased production of sheets, the imports did not show any improvement. It shows that in those sections also Tatas' share must have increased during the period. Finally from table III we find that the share of the Tatas in the total is maintained at nearly 75% except in the final year. The imports in this table include some iron goods also coming in the section Iron and Steel products. If those are excluded, we find that the share of the Tatas in the protected sections of steel should have increased over the previous period.

We find from table II that the most important items of imports were sheets and plates, tubes, pipes, hoops and strings, bars, etc., and structural materials, for some of which protection was not given. Later the Tatas

made arrangements to manufacture these varieties also. The present war has created a boom in the industry and the addition of the new plant for manufacturing steel makes the position of the industry in the market stronger and also creates the necessity to find additional use for the steel products.

PRODUCTION OF PIG IRON AND STEEL IN INDIA

(000 tons.)

Year. ¹	Production of Pig-iron.			Exports.	% of exports to production.	Production of Finished steel.
	Tatas.	Others.	Total.			
1914	162	73	235	53.7	22.9	67
1915	155	87	242	68.5	31.6	76
1916	153	92	245	112.8	46.0	93
1917	168	80	248	67.6	27.3	114
1918	198	49	247	4.5	1.8	130
1919	232	85	317	38.7	12.2	134
1920	222	89	311	44.4	14.3	113
1921	282	86	368	57.9	14.1	125
1922	228	92	320	98.6	30.8	112
1923	392	98	490	181.5	30.8	151
1924	540	133	673	271.1	30.4	248
1925	563	317	880	407.8	45.6	320
1926	609	311	920	315.2	34.9	360
1927	624	516	1140	381.0	33.7	429
1928	511	541	1052	428.6	42.6	276
1929	723	669	1392	548.9	39.5	412
1930	696	479	1175	502.6	42.8	434
1931	800	258	1056	319.0	30.1	450
1932	700	213	913	248.4	27.2	427
1933	794	262	1058	372.0	27.9	531
1934	882	438	1320	398.1	30.1	604
1935	898	554	1452	472.6	32.6	646
1936	858	682	1540	606.0	39.3	667
1937	885	736	1621	597.3	36.8	660

THE PAPER INDUSTRY

India was famous for the manufacture of fine paper by hand, and before its displacement by the machine-made paper of Western countries hand-made paper was freely used in the country for writing purposes. Even now we find vestiges of this industry in remote corners of the country not reached by the machine civilisation. But like other cottage industries, viz., cotton and jute, textiles, sugar, metallurgy, etc., it gave way before the onslaught of the machine products, and the country gradually became an importer of paper.

1. Year from April to March.

The modern paper manufacturing industry of India was started in 1870, with the establishment of the Bally Mills on the Hoogly, and its neighbourhood still retains the premier place in this industry in the country. Though three mills, viz., Bally, Titaghur and Imperial Paper Mills, were started in this region in the two decades starting with 1870, the first and the last were liquidated early in the present century, the machinery of both being bought by the Titaghur company. From 1905 till 1918 Titaghur was the only company on the Hoogly manufacturing paper in the two mills. In the post-war period the Indian Paper Pulp Company started a mill at Naihati to take advantage of the bamboo forests nearby. As regards the up-country mills, the Bengal Paper Mill at Raniganj (1889), the Upper India Paper Mill at Lucknow (1879) and the Deccan Paper Mill at Poona (1885) are the most important. The Gwalior mill, started in 1881, was closed down for a long time due to losses and was eventually taken over by the Bengal Paper Mill. There were three other small mills, two in Bombay and one in Travancore State. During the post-war period two other mills, one in Madras at Rajahmundry, and one in the Punjab, were started. Thus by the time of enquiry of the Tariff Board on Paper Industry in 1925, there were nine mills, six of which (four in Bengal, one in the United Provinces and one in Bombay) had a large manufacturing capacity, while the two other mills in Bombay and one in Travancore were unimportant. The same mills continued to work till 1931 also and the two new concerns in Rajahmundry and the Punjab failed to work for various reasons. In 1935 a new mill named the Gujerat Paper Mills, Ltd., was started near Ahmedabad. Thus in 1937-38, ten mills were actually working. We find that in the course of nearly 70 years, the number of factories did not increase considerably; but from the chapter on the size of industry we note that the number of machines in some of the factories and hence their manufacturing capacity increased to a great extent.

The following tables give the number of mills, and the quantity of paper manufactured in the different years of the present century.

TABLE I — PRE-WAR

Year ¹	No. of Mills	Production (000's of tons)	Index of production
1900	8	20.5	77
1901	9	20.9	79
1902	8	20.8	79
1903	9	19.5	74
1904	8	20.1	76
1905	7	19.7	74
1906	8	21.2	80
1907	8	24.7	93
1908	9	25.4	96
1909	9	25.4	96
1910	9	26.4	100

¹ Year from 1st April to March,

Year	No. of Mills	Production 000's of tons	Index of production
1911	9	26.5	100
1912	9	26.9	102
1913	9	27.1	102
1914	11	28.7	108
1915	11	30.4	115
1916	10	31.9	121
1917	10	31.9	121
1918	9	31.4	119

The above table shows that till the beginning of the first world war there were 9 paper mills in India, one or two of which were sometimes closed. Subsequently two more were added and by the end the number again decreased by two. Thus throughout the whole of pre-war and war periods there was not much addition to the number of mills. The production at the beginning of the century was about 4/5 of the base level (1909-10 to 1913-14) and the index fluctuated between 74 and 80 in the first seven years. But with the impulse of Swadeshi movement in 1906 the production increased from year to year, the greatest increase being in the first year. By 1912 it came to some steady level but got a fresh impulse during the great war of 1914-18. By the end of the war the production was 20% over the base level and 50% over that of the beginning of the century. The great increase during the war is explained by the fall in imports.

TABLE II—POST-WAR

Year ¹	No. of Mills.	Production. 000 tons.	Index of production.
1919	9	30.9	117
1920	8	29.4	111
1921	8	28.7	108
1922	8	23.9	90
1923	8	26.0	98
1924	8	25.7	97
1925	9	28.6	108
1926	9	32.1	121
1927	9	33.9	128
1928	9	38.1	144
1929	10	40.8	154
1930	11	39.8	150
1931	10	40.7	154
1932	10	40.6	153
1933	10	43.4	164
1934	10	44.5	168
1935	11	47.6	180
1936	11	48.5	181
1937	12	57.1	215

1. Official year April to March.

It will be noted that the slight setback in production noticed during the closing year of the war was accentuated in the succeeding years by the revival of competition from imports, and in 1922 the production was actually 10% below the pre-war level. Though there was slight improvement in the succeeding two years, still production was below the war period. This was followed by an agitation for protection. The Tariff Board appointed in 1924 submitted their report in 1925 and the necessary legislation on the recommendations immediately followed. But this protection was given only to certain classes of paper. Anyhow there was immediate stimulus and the index of production reached the high figure of 154 in 1929. With the advent of the great economic depression there was naturally stagnation. But the Tariff Board appointed in 1931 recommended further extension of the period of protection and this gave a fresh stimulus so that by the end of the period the index of production shot up to the high figure of 215. It has already been pointed out that the protection was not given for all kinds of paper. The progress made by the protected part of the industry can be better appreciated from the following table.

TABLE III (000 of tons)

Year ¹	Imports of protected paper.	Production.	% share of production out of the total.
1924	20	23	54
1925	17	25	59
1926	17	28	62
1927	18	30	63
1928	19	34	64
1929	20	33	63
1930	14	35	71
1931	12	36	75
1932	11	35	76
1933	13	38	75
1934	11	40	78
1935	12	43	78
1936	12	43	78

The above table shows that during the period imports declined whereas internal production increased rapidly so that the share of the indigenous production rose from 54% to 78% in the course of 12 years. While the imports of protected paper declined, the total imports more than doubled. This shows that the protection granted in 1925 was really effective in saving the industry from foreign imports of those classes of paper. It must be admitted that in the earlier years a good part of this progress was made not by using the indigenous materials for the pulp, but by importing pulp from abroad and manufacturing it into paper. This is shown in the following table.

1. Official year April to March.

It will be noticed that the main items of imports come under the head old newspapers, newsprint, paste-board, etc., and packing paper in order of magnitude. All these are items which do not come under protection. In fact, old newspapers, which is the biggest item having a share of nearly 40% of the total imports, have nothing to do with the manufacture, because these are bought here mainly for wrapping purposes. As regards newsprint, this is a special variety of cheap paper, made out of mechanical pulp, required for the printing of daily and other newspapers. The manufacture of this kind of paper in India is not possible under the existing circumstances unless the mills are given tariff protection or subsidy to cover the losses which are bound to arise in the earlier years. Increase in tariff rates may lead to a rise in the price of newspapers which will be strongly opposed. In fact in 1937-38 the Government had to reduce the high revenue duty on newsprint which was increased during the last depression. So if the Government want to encourage the production of this class of manufacture also, they must grant suitable subsidies as were given to the steel industry between 1923-26.

With the establishment of new mills there is a likelihood of production exceeding the demand. The Tariff Board of 1938 estimated that by 1940-41 the "production of protected classes of paper may exceed the demand by some seven thousand tons, but the total production will fall short of the total demand by twelve thousand tons taking protected and unprotected classes together"¹ Hence there arose the need to produce some unprotected classes of paper also, and the manufacturers claimed for the extension of protection to cartridge paper, poster paper, blotting paper and kraft-paper. But the Tariff Board remarked "On the evidence before us we did not feel justified in commending the extension of protection to any new class of paper"² But they felt that the manufacture of kraft packing paper was promising; and as the only mill which was established by that time to manufacture this class of paper and other classes had not had sufficient experience, they recommended that the question of protection to this class of paper might be investigated by a Special Board towards the end of 1939. But with the outbreak of war the competition of imports had become insignificant and the industry had attained a fair level of prosperity. However, when external competition is revived by imports, things will become worse, unless the mills consolidate their position in the new classes of manufacture. The prosperity of the industry depends upon its ability to get a strong foot-hold in their manufacture.

THE CEMENT INDUSTRY

Portland cement was first manufactured in Madras in 1904; but the real foundations for this industry in this country were laid only just before the great war of 1914-18, with the establishment of the three companies, the Indian Cement Company at Portland, the Katni Cement and Industrial Company at Katni and the Bundi Portland Cement Co., Ltd., in Rajputana. The industry proved very valuable to the Government during the great

1. Vide Report of the Tariff Board on Paper Industry, 1938, p. 44.

2. Ibid., p. 59.

war of 1914-18 when they took control of the production of these three concerns to meet the extraordinary demands during the period. The prosperity of these companies, which extended their original plant, encouraged the floatation of seven more companies during the post-war boom period 1919-22. But this sudden expansion and the resumption of imports after the war, produced a glut in the market, which resulted in a fall in prices below manufacturing costs and the industrialists applied for protection for the industry. But the Tariff Board did not recommend protection as it was suffering from internal competition. The progress of the industry in the quarter century from 1914 to 1937 is given in the following table.

Year.	Production. (thousand tons)	Imports. (000 tons)
1914	1	151
1915	18	126
1916	39	81
1917	74	70
1918	84	20
1919	87	83
1920	91	119
1921	133	107
1922	151	110
1923	244	98
1924	264	88
1925	361	68
1926	388	55
1927	478	69
1928	558	75
1929	561	75
1930	564	68
1930-31	570	64
1931-32	583	59
1932-33	586	61
1933-34	642	49
1934-35	748	49
1935-36	886	43
1936-37	997	48
1937-38	1170	25

This table shows the tremendous progress made by the industry. Starting with about a thousand tons, it expanded from year to year without break till the end. One of the main recommendations of the Tariff Board was the necessity of co-operation among the manufacturing concerns to popularise the use of cement. Accordingly the Indian Cement Marketing Association was formed in 1926 by the joint efforts of the companies and one

year later, the Concrete Association of India was formed to investigate and popularise new uses for cement. The next progressive step was taken in 1930 by the formation of the Cement Marketing Company of India Ltd., to take over the control of sales and distribution of the different concerns. At first all but two joined the Association and noticing the benefits, the other two also came into the fold. The results of mutual co-operation, organised methods of selling and distribution, widespread propaganda and education, backed by the existing tariff were reflected in the tremendous growth of consumption of the commodity till the great depression of 1930 brought a check upon its progress. It will be noticed that, as in paper, increased production was brought about mainly in the expansion of existing concerns rather than by an increase in the number of factories. Still the industrialists were alive to the mal-distribution of factories with respect to some important markets, and to correct this, they began to start new factories in such areas. Thus in 1932 a factory was established in Coimbatore to cater to the South Indian market and another in Attock in 1934 to supply to the Punjab.

Though the quota system of the Cement Marketing Company worked well for sometime, some defects in the way of economic distribution were noticed after a few years. In working out the allocation to total sales, it often became necessary to transport cement from distant factories to areas which would have been more economically served by another factory. Hence to bring about greater economies in production and distribution, the then existing companies were amalgamated in 1936 into the Associated Cement Co., Ltd., whose main objects were (1) To utilise to the fullest advantage the output of all factories in their most economic markets. (2) Regulation of production throughout the country in direct relation to demand for the purpose of effecting economies in working and distribution costs. (3) The improvement of the industry by the development of production in suitable localities, and (4) Control of production in unsuitable areas, lack of control in this respect being one of the most serious defects in the past.

This move and the lifting of depression brought about a further increase in total production. At the same time a rival group under the Dalmia Managing Agency was formed to establish some more factories. While apprehension was felt about the desirability of this venture, the managing agents of the new concern claimed that the costs of production could be brought down still further thus stimulating consumption. It resulted in a rate-war in certain areas, where rival factories were established. The problem before the industry was to find the market for the large increase in output. The war to some extent solved the problem, by the extra demand made for the product.

THE COAL INDUSTRY

Though some attempts were made for the exploitation of coal for commercial purposes in the last quarter of the eighteenth and the first half of the nineteenth centuries, the development was slow owing to lack of transport facilities. The demand also was limited because coal was little

used in India for domestic consumption, and the railways which are still the chief consumers were not yet well developed. Coal was never extensively used in cottage industries, and large-scale industries were not yet established. The opening of the East Indian Railway, as far as Raniganj in 1855, opened a new chapter in the history of the coal industry. This was followed by a rapid increase in demand for railway and industrial purposes and the first survey of the coal resources of the country was made and published by Thomas Oldham in 1867. The examination of the Jharia coal-field by Mr. T. H. Ward of the East Indian Railway in 1870 added a fresh chapter to the history of the industry and production increased by leaps and bounds from decade to decade.

The following table gives the indices of total production of the two important fields Raniganj and Jharia, with the pre-war quinquennium as base. The shares of these two regions in the total are also given.

PRODUCTION 1900-18

Year.	Indices of production.			Percentage share of			Total	
	Raniganj.	Jharia.	Total.	Raniganj.	Jharia.	Others.	Production. (millions of tons)	Consumption.
1900	56	25	45	42	28	30	6.1	5.7
1901	62	28	49	42	29	29	6.6	6.3
1902	67	35	55	41	33	26	7.4	7.2
1903	67	36	55	41	34	25	7.4	7.1
1904	73	42	61	41	35	24	8.2	7.9
1905	72	45	62	39	37	24	8.4	7.8
1906	80	60	72	37	42	21	9.8	9.0
1907	87	76	83	36	47	17	11.1	10.8
1908	92	94	95	33	51	16	12.8	12.5
1909	88	85	88	34	49	17	11.9	11.8
1910	92	85	89	35	48	17	12.0	11.4
1911	94	93	94	34	50	16	12.7	12.2
1912	108	112	109	34	52	14	14.7	14.4
1913	117	126	120	33	53	14	16.2	16.1
1914	108	134	122	30	56	14	16.5	16.3
1915	120	133	127	32	53	15	17.1	16.5
1916	121	131	128	32	52	16	17.3	16.4
1917	118	143	135	30	54	16	18.2	17.9
1918	140	160	153	31	52	17	20.7	20.7

The above table shows that the quantity of coal produced in India in 1900 was less than half that of the pre-war quinquennium, and in a decade the production doubled. The index surpassed the base period level in 1912, increased rapidly during the war, reaching the high figure of 153 in the last year of war compared with 45 in the beginning. But this expansion

was more rapid in the Jharia coalfields than in Raniganj. In the former the index of production was 25 in the beginning, it exceeded the base period level in 1912 and reached the high figure of 160 in 1918, while for the Raniganj fields the production in 1900 was 56% of the pre-war level, exceeded the base period level in 1912 and was 140 in 1918. This shows that during the above period production in Jharia fields increased at a much more rapid rate than in the Raniganj fields. This is reflected in the percentage share of these two areas in the total, which shows that whereas Raniganj's share gradually decreased from 42 in the beginning to about 30 in the end, the share of Jharia fields increased from 26 in the beginning to 52 in the end. It is interesting to note that the share of the remaining fields decreased from 30 in the beginning to 14 in 1912, kept constant for 3 years and then increased to 17 in 1918. This shows that till the war period, the other fields were not working as well as Raniganj and Jharia, and with the stimulus of war they increased their production rapidly. The last two columns show that India had been a net exporter of coal though the quantity exported was very small compared to production. Some port cities like Bombay found it cheaper to import coal from Africa and European countries than paying heavy railway freight from Bihar and Bengal. On the other hand India could export coal cheaply to Ceylon and Federated Malay States.

PRODUCTION 1919-1938

Year.	Indices of production.			% share of			Total	
	Rani- ganj.	Jharia.	Total.	Rani- ganj.	Jharia.	Others.	Produc- tion. (millions of tons)	Consump- tion.
1919	149	177	167	27	52	21	22.6	22.2
1920	109	136	133	28	52	20	18.0	16.8
1921	114	147	143	27	52	21	19.3	20.1
1922	114	145	141	27	52	21	19.0	20.1
1923	122	151	146	28	53	19	19.7	20.1
1924	132	158	157	29	51	20	21.2	21.4
1925	126	156	155	27	51	22	20.9	21.1
1926	134	151	155	29	49	22	21.0	20.5
1927	142	154	163	29	48	23	22.1	21.7
1928	142	156	167	29	47	24	22.5	22.1
1929	150	158	173	29	46	25	23.4	22.9
1930	158	157	176	30	45	25	23.8	23.5
1931	143	128	161	30	45	25	21.7	21.4
1932	141	125	149	32	42	26	20.2	19.7
1933	137	119	147	32	41	27	19.8	19.4
1934	149	132	163	31	41	28	22.1	21.8
1935	161	135	170	32	40	28	23.0	22.9
1936	160	129	167	32	39	29	22.6*	22.0*
1937	158	140	185	29	38	33	25.0*	24.1*
1938	190	163	210	31	39	30	28.3*	27.0*

* Excluding Burma.

Production reached a record level for the first quarter of the century in the first year after war. But there was a sudden drop in 1920 and the industry continued to be in a depressed condition in the first quinquennium of the twenties. This was due to the cumulative effect of several factors, namely, shortage of railway wagons, inadequacy of labour, prolonged strikes, fall in exports and increase in imports. The rapid expansion in the demand for coal after the war resulted in a heavy strain on the railways in 1919 and 1920. Hence in 1920 the Government of India prohibited the export of coal to foreign countries except under license, and diverted the inland coal traffic from railways to coastwise steamers. At first permission for export of coal was given to Ceylon, Aden and Singapore, but later several restrictions were placed on these exports also on account of the poor raisings of coal in 1920. This resulted in the diversion of those markets from India to South Africa. On account of the superiority in quality and cheapness in price, the coal from Africa established its position in those markets, and though the restrictions on coal were gradually lifted between 1922 and 1923, the trade could not recover the lost ground. Bombay being the biggest industrial centre was the chief internal market, and here partly the competition of imports and chiefly the competition of electricity and oil in railways and industrial establishments reduced the demand for coal. However the steps taken on the recommendation of the Indian Coal Committee of 1925 and of the Tariff Board on Coal Industry in 1926 helped to check the imports and brought a slight recovery in exports. The great depression of 1930 again had its repercussion on this industry, and recovery started from 1934 the last two years being the most prosperous. The continuous increase in the share of Jharla fields stopped with 1914 and for the next decade its share was almost constant. But from 1924 this came down gradually while that of Raniganj went up simultaneously. From 1930 the indices of Raniganj fields exceeded those of Jharla fields, i.e., the rate of increase of production compared with that of the base period was greater in the former than in the latter. Another point to be noted is that the share of other fields declined rapidly from 30 in the beginning to 14 in the pre-war triennium. During the war this share commenced to increase, and this process was accelerated in the post-war period so that by the end of the period the share of the other coal fields (except Raniganj and Jharla) came back to 30. But whereas Raniganj was individually the biggest in 1900 Jharla came to occupy that position, the difference between the two being only 8 points. The following table shows that in recent years both the major fields have been producing more and more of superior coal, and the share of Raniganj had always been greater than that of Jharla.¹ But this will result in the rapid exhaustion of the limited resources of good coal and the consequences will be serious unless some effective steps are taken.

1. Vide Report of the Coal Mining Committee, 1937, Vol. I, pp. 33-34.

**PERCENTAGE OF SUPERIOR COAL TO THE TOTAL COAL
RAISED IN JHARIA AND RANIGANJ.¹**

Year.	Jharia.	Raniganj.
1920	72	75
1921	64	75
1922	59	74
1923	63	76
1924	67	78
1925	71	80
1926	72	83
1927	73	87
1928	74	90
1929	76	91
1930	77	92
1931	78	92
1932	78	93
1933	78	93
1934	77	94
1935	77	95
1936	76	94

Thanks to the efforts of the Indian Soft Coke Cess Committee, the demand for the domestic consumption of the second class coal also has been gradually increasing. From the last two columns, p. 120, we find that from 1921 to 1925 India became a net importer of coal though the percentage was very small. In all the other years it was a net exporter as before.

It will be interesting to find out changes if any in the uses of coal in the period under consideration. The Indian Coal Statistics gives the estimates of consumption of the different agencies. The following table gives these details and the percentage share of each in the total in certain years.

USE OF COAL IN DIFFERENT WAYS IN THE WAR
(thousand tons)

	1907	per cent.	1917	per cent.	1927	per cent.	1938	per cent.
Railways.	3,774	32.4	5,620	31.5	7,258	33.5	8,283	30.3
Admiralty & R. I.	...	...	1,429	8.0	27	0.1	27	0.1
Bunker.	1,100	10.3	1,514	8.5	1,317	6.1	884	3.3
Cotton mills.	794	7.4	927	5.2	830	3.8	1,979	7.3
Jute.	667	6.2	1,026	5.7	935	4.3	773	2.9
Iron and steel industry.	131	1.2	807	4.5	5,260	24.2	5,905	21.8

1. Vide Report of the Coal Mining Committee, 1937, pp. 33-34.

	1907	per cent.	1917	per cent.	1927	per cent.	1938	per cent.
Port trusts.	91	0.8	201	1.1	205	0.9	115	0.4
Inland steamers.	450	4.2	508	2.8	636	2.9	508	1.9
Bricks, kilns, etc.	a	...	358	2.0	565	2.6	1,047	3.8
Tea gardens.	96	0.9	248	1.4	223	1.0	186	0.7
Paper Mills.	a	...	170	1.0	156	0.7	233	0.9
Collieries.	1,100	10.3	2,186	12.2	2,208	10.2	1,445	5.3
Others.	2,824	26.3	2,855	16.1	2,085	9.7	5,762	21.3
Total ...	11,027	...	17,849	...	21,105	...	27,147	...

This table reveals certain interesting features. Between 1907 and 1938 the consumption of coal more than doubled. Throughout the period Railways remained the chief consumers and the share was always slightly above 30%. Share of Admiralty and Royal Indian Marine was high during the great war of 1914-18, but it dwindled into insignificance later. The shares of Bunker coal and Inland Steamers also were gradually coming down (except for a spurt in the former in 1917 and 1927), the former being obviously due to war. Except in the above two years the quantity consumed was remaining steady or showing downward trend in Bunker coal, whereas in the inland steamers the quantity increased during the interval. The quantities purchased by Port Trusts and tea gardens were increasing and the shares fluctuated about 1%. But in the final year there was a fall in both. The share of cotton mills showed a falling tendency till 1927, but in 1938 there was a sudden jump when it nearly recovered its former position. In jute the quantity increased and share decreased till the great war of 1914-18 and later there was a fall in both. The quantity consumed in collieries increased till 1922 and since then there was a falling tendency which was greatest between 1927 and 1938. The home and other industrial consumption showed wide fluctuations, but iron and steel alone showed tremendous expansion both in quantity and share. This more than made up for the loss in several directions. The future trends point to the continuation of the tendency for oil and electricity to displace coal, except in railways and certain industries in which it is a necessary ingredient, e.g., iron and steel, cement, etc.

Efficiency:—The following table shows the output of coal per head in different years and in different countries of the world.

Country.	Year.	Above & below.	Below only.	Year.	India.	
					Above.	Below.
U. S. A.	1936	761	927	1926	113	166
Great Britain.	1930	287	369	1930	129	188
Germany.	1937	383	548	1934	130	181
France.	1938	193	282			
India.	1938	125	205			

This shows that the output per head had been increasing, but still it is very small compared with foreign countries. It is partly due to the fact that on account of cheap labour and predominance of small units, mechanisation is on a smaller scale in India than in other countries. But the following table¹ shows that great progress has been made in Raniganj and Jharia even in this direction after the war

Number of collieries raising coal by		1919		1935	
(a) hand labour,	251	43%	76	20%	
(b) Steam power only or mainly steam power,	325	55%	285	74%	
(c) Electric power only or mainly electric power.	11	2%	24	6%	

The number of collieries came down from 587 to 385; of these the fall was heavy in those working on hand labour and next came steam power. There was an increase in the number using electric power though their share was very small. Nearly three-fourths of the collieries were using steam power.

1. Report of the Indian Coal Committee, 1937, p. 242.

Chapter V

INDUSTRIAL PRODUCTIVE ACTIVITY

THE importance of a series of index numbers of industrial production in the regulation of the economic activity of a country, cannot be over-emphasized. "(1) An index of production is obviously essential if we are ever going to attempt consciously to influence or to moderate trade fluctuations by monetary or other policy. (2) Again, an index of production is really needed if we are to have a proper and appropriate wage adjustment in the country."¹ Hence the construction of such a series is one of the first steps in the diagnosis of the economic situation of a country. It is a matter of common experience that during certain periods of time the productive capacities of different industries are fully utilised and in other periods they are partly idle. Again the amplitudes of these fluctuations are different for different industries. Hence industrial productive activity is some abstract quantity which may be taken as the greatest common measure of the individual activities of the different industries, and the problem is to devise some method of measuring this quantity. The construction of this index encounters on the one hand the difficulties common to the construction of all index numbers and on the other some difficulties peculiar to it. Among the former we may consider the lack of uniformity and continuity of data, the relative merits of different kinds of averages, the difficulties in choosing a proper system of weights, etc. Among the latter we may place the difficulty of aggregating several things some of which are measured in tons, others in yards and some others in gallons, etc.

In order to construct a series of index numbers of the volume of industrial production, it is in the first place necessary to select the representative industries and also for each industry to select "one or more exactly definable products, which on the one hand give definite indications of the activity of the industry, and on the other are suitable for combination in a general index of production."² Having chosen the representative industries and the units of measurement of each industry, we have to choose a base period for working out the relatives for the different industries and then compound the individual indices according to the relative importance of these separate industries. The productive contribution of an industry is the value of the work of adaptation on the value of the materials of various kinds used in carrying on the industry. Hence the different industries have to be given weights in proportion to the net output of the industry, namely, the excess of the value of the products over the value of the materials used in their manufacture. The latter can be obtained by

1 *Indices of Industrial Productive Activity*, J.R.S.S., 1927, p. 225.

2. A. L. Bowley and D. H. Robertson, *A Scheme for an Economic Census of India*, p. 42.

taking a census of production. A fairly reliable index of the ebb and flow of the industrial activity in the aggregate can be obtained by thus compounding the series relating to the leading industries.

In India, so far no census of production has been taken and the Government have not yet carried out the recommendations of Dr. Bowley and Prof. Robertson for taking an Economic Census of India. Consequently one must fall back upon some indirect methods of assigning the weights. One method that readily suggests itself is on the basis of the number of people employed. This is obviously inefficient because the net output of different industries is not directly proportional to the number of people employed. The capital invested is also not quite appropriate on similar grounds. Hence we must try to seek some internal evidence of the relative importance of the different industries and in this the method given by Dr. Rhodes for constructing an Index of Business Activity comes in very handy.¹ A brief account of the method may be given here.

We assume that each series is composed of a common factor and the resultant effect of a number of other factors. To put it in algebraic notation if X_t represents a member of the series at time t , I_t the value of the common factor, and X_t^1 the resultant effect of other factors,

$$X_t = r_x I_t + X_t^1$$

Similarly $Y_t = r_y I_t + Y_t^1$, etc.

Here I_t is the common element, and as it is transformed into different standards and units and relative bases, the factors r_x, r_y etc., are introduced in the expression. Suppose we measure the deviations of these indices from their respective arithmetic means. Then, if x_t, i_t, x_t^1 , etc. are the respective deviations

$$x_t = r_x i_t + x_t^1 \quad (1)$$

$$\text{Similarly } y_t = r_y i_t + y_t^1 \quad (2)$$

squaring (1) and summing for 't' from 1 to n we get

$$Sx_t^2 = r_x^2 Si_t^2 + Sx_t^{1^2} + 2 r_x Si_t x_t^1$$

if we can assume that i_t and x_t^1 are independent variables

$$Sx_t^2 = r_x^2 Si_t^2 + Sx_t^{1^2}$$

Now multiplying (1) and (2) and summing over the whole period we obtain in a similar manner

$$Sx_t y_t = r_x r_y Si_t^2$$

$$\text{put } R_x = r_x \sqrt{Si_t^2}; R_y = r_y \sqrt{Si_t^2}; \therefore R_x R_y = Sx_t y_t$$

Similarly for different pairs of products we get similar expressions and the number of these pairs is $\frac{n}{2}$ where n is the total number of individual series. From these equations we have to determine the value of the unknown quantities R_x, R_y , etc. This can be done by putting

$$\log R_x + \log R_y = \log Sx_y$$

1. Dr. E. C. Rhodes, *The Construction of an Index of Business Activity*, J.R.S.S., Vol. 100, pp. 121-24.

and finding the values of R_x , etc., by the method of least squares. Also $S_x^2 = R_x^2 + S(x^{1^2})$ and from the values of S_x^2 and the estimated value of R_x^2 , $S_x^{1^2}$ can be determined. Thus S_x^2 has been split up into two components one due to the common factor and the second to the other factor.

If we assume that the residues x_t^1 are normally distributed about zero with standard deviation σ_x then the chance of getting a residual between

$$\frac{-\frac{1}{2} \frac{x_t^2}{\sigma_x^2}}{\sigma_x^2}$$

the limits x_t^1 and $x_t^1 + dx_t^1$ is $\frac{1}{\sqrt{2\pi}\sigma_x} e^{-\frac{1}{2} \frac{x_t^2}{\sigma_x^2}} dx_t^1$. The combined chance of residuals x_t^1, y_t^1, \dots etc., is proportional to

$$e^{-\frac{1}{2} \left(\frac{x_t^2}{\sigma_x^2} + \frac{y_t^2}{\sigma_y^2} + \dots \right)}$$

the exponent may be written

$$-\frac{1}{2} \left\{ \frac{(x_t - r_x i_t)^2}{\sigma_x^2} + \frac{(y_t - r_y i_t)^2}{\sigma_y^2} + \dots \right\}$$

The most likely value of it can be found by making this probability a maximum. This gives us

$$i_t = \frac{x_t \frac{r_x}{\sigma_x^2} + y_t \frac{r_y}{\sigma_y^2} + \dots}{\frac{r_x^2}{\sigma_x^2} + \frac{r_y^2}{\sigma_y^2} + \dots}$$

Now σ_x^2 may be approximately taken equal to $\frac{S_x^{1^2}}{n}$. Substituting for r_x and σ_x^2 etc., we obtain

$$\frac{i_t}{\sqrt{S_{it}^2}} = \frac{x_t \frac{R_x}{S(x^{1^2})} + y_t \frac{R_y}{S(y^{1^2})} + \dots}{\frac{R_x^2}{S_x^{1^2}} + \frac{R_y^2}{S_y^{1^2}} + \dots}$$

Thus we may use for weights figures proportional to $\frac{R_x}{S_x^{1^2}}$, etc. With these

we can obtain a series of figures proportional to the i 's approximately. We may now calculate $S i^2, S i x, S i y$, etc., using this new series. But $i x = r_x i_t + i_t x_t^1$ and summing gives $S i x = r_x S i_t^2 + R_x \sqrt{S i_t^2}$ neglecting $S(i_t x_t^1)$ i.e. assuming that i_t and x_t^1 are independent. Thus we get the new estimates of R_x and $R_x = \frac{S i x}{\sqrt{S i_t^2}}$, etc., using the new calculations. These new estimates of the R 's will give better values for $S(x^{1^2}), S(y^{1^2})$, etc. Hence we get a better system of weights and better values of i 's. Also

the correlation between the aggregate series and the individual series can be found from the formula

$$r_{ix} = \frac{\text{Six}}{\sqrt{Si^2} \sqrt{Sx^2}}$$

This method of determining the weights is superior to the method of net output from a census of production in one important respect. During a trade cycle the relative importance of the different industries changes to a considerable extent. During periods of greatest activity industries producing capital goods like tools, machinery, etc., prosper very much, and in periods of reaction or depression they suffer worst. The fluctuations are not so great in consumers' goods industries. Accordingly the weights of the different industries depend to some extent on the time of census, i.e., whether it is taken during a peak year or a depression year. The above method does not suffer from this drawback because it is calculated from the data over a series of years. It must be remembered that just as census of production should be taken periodically to furnish information by means of which provisional results, based on the proportionate importance of industries shown by previous enquiries, may be corrected or adjusted, the method of ascertaining weights also should be repeated periodically. The interval between successive enquiries should depend upon the rate of development of the industry, being short if the rate is fast and long if it is slow.

INDUSTRIES TO BE INCLUDED, SOURCES OF INFORMATION AND FREQUENCY COLLECTION OF THE DATA

Though an annual index of industrial production may be sufficient for several purposes, to be of greater use in gauging the situation and adjusting production to changing circumstances, it is useful to have a monthly index. This has important bearing on the particular industries to be included because it is not for all industries that these details of monthly production are available in India. (In the series of industrial production we shall include coal mining also.) This study cannot be extended over a long period of time because for the major industries of India, except cotton and coal, monthly figures were not published before 1934 when "Monthly Statistics of the Production of Certain Selected Industries in India" was started. The first volume contains figures commencing with the official year 1932-33. The industries included in this publication are (1) jute, (2) iron and steel, (3) sugar, (4) cement, (5) paper, (6) sulphuric acid, (7) sulphate of ammonia, and (8) matches. Monthly figures of mineral production (coal, kerosene and petroleum) are available in the "Monthly Survey of Business Conditions". Figures of cotton manufactures are available in the "Monthly Statistics of Cotton Spinning and Weaving in Indian Mills". These are all the items that are available for inclusion in the index. Of these the following are chosen as they are the most important items: (1) cotton manufactures, (2) jute, (3) pig-iron, (4) cement and (5) coal. Sugar is not suitable because it is mainly seasonal. The different series have to be corrected for seasonal

variations. In the following calculations, the index numbers with the average of 1935 as base and corrected for seasonal variations and published in the *Capital* from time to time are taken for analysis. The period extends from April 1932 to March 1938.

WEIGHTS ON THE BASIS OF DR. RHODES' METHOD

Suppose we represent the indices of cotton by U, jute by V, pig-iron by W, cement by X and coal by Y. In the notation given above, the following table gives the values of the different product sums and squares.

	U	V	W	X	Y
U	7,405	9,486	10,959	15,079	6,061
V		31,845	17,089	25,887	8,143
W			29,673	29,733	10,529
X				42,600	13,147
Y					7,401

By the method described above the following values of R's and residuals are obtained.

$R_u = 78.860$	$S U^1_2 = 1,186$
$R_v = 12.0824$	$S V^1_2 = 17,248$
$R_w = 144.646$	$S W^1_2 = 8,751$
$R_x = 197.442$	$S X^1_2 = 3,617$
$R_y = 70.650$	$S Y^1_2 = 2,410$

The following table gives the product sums SUV together with the products of R's in pairs, and the difference between them as percentages

of the products of the R's.

	u	v	w	x	y	r 5% 0.232 r 1% 0.302 coefficient of correlation
v product	9,486					
Ru Rv	9,287					γ_{uv} 0.04
Difference %	2					
w	10,959	17,089				γ_{uw} 0.05
	11,117	17,477				γ_{ux} 0.04
Difference %	-1	-2				γ_{uy} 0.29
x	15,079	25,887	29,733			γ_{vw} -0.03
	15,175	23,858	28,559			γ_{vx} 0.02
Difference %	-1	9	4			γ_{vy} -0.06
y	6,061	8,143	10,529	13,147		γ_{wx} 0.21
	5,572	8,536	10,219	13,949		γ_{wy} 0.07
Difference %	9	-5	3	-6		γ_{xy} -0.27

We find that the differences between products are negligible.

All the coefficients of correlation are insignificant at 1% level and only two are significant at 5% level. If we use these values of R's and S U ¹/₂ etc., and calculate the weights we get the following results.

	u	v	w	x	y
	0.0665	0.0070	0.0165	0.0546	0.0293
% to total	38	4	9	31	18

Using these weights we can calculate i's for each month and combine them with the U's etc. We get the following results.

S i v	=	15,522
S i U	=	9,938
S i V	=	16,359
S i W	=	17,496
S i X	=	23,071
S i Y	=	8,857

From these we can calculate the new values of R's and sums of the squares of residuals

R _u	79.769	S u ¹ / ₂	=	1,042
R _v	131.312	S v ¹ / ₂	=	14,602
R _w	140.437	S w ¹ / ₂	=	12,430
R _x	185.194	S x ¹ / ₂	=	8,303
R _y	71.093	S y ¹ / ₂	=	2,347

The following table gives the product sums SUV and those calculated from residuals and the difference between them as percentages of the product of R's.

		u	v	w	x	coefficient of correlation	
v	1					YUV	-0.254
	2					YUW	-0.07
	Difference					YUX	0.108
	%						
w	1	10,959	17,089			YVY	0.537
	2	11,203	18,441			YVW	-0.10
	Difference					YVX	0.14
	%	-2	-7				
x	1	15,079	25,887	29,733		YVY	-0.20
	2	14,773	24,318	26,008		YWX	0.367
	Difference					YWY	0.10
	%	2	7	14			
y	1	6,061	8,143	10,529	13,147	YXY	-0.04
	2	5,671	9,335	9,984	13,136		
	Difference						
	%	-14	-13	5	-		
1 SUV						2 R _u R _v	

From the above table we notice that the correlation between residuals u and y and that between w and x are highly significant. Apart from these the other values seem to be reasonable for our assumption. We may compare the residuals obtained from the 1st and 2nd methods.

PRODUCT SUM OF RESIDUALS

		u	v	w	x
v	1	199			
	2	-989			
w	1	-158	-388		
	2	-244	-1352		
x	1	-96	2031	1174	
	2	306	1569	3725	
y	1	489	-393	310	-802
	2	-839	-1192	545	-19

Sums of Squares of Residuals

	u	v	w	x	y
1st method	1186	17248	8751	3617	2410
2nd method	1042	14602	12430	8303	2347

We find a lot of difference between the product sums and squares of the residuals of the two methods. If we calculate the weights on the new basis we arrive at the following results.

	u	v	w	x	y
%	0.0766	0.0090	0.0113	0.0223	0.0303
	51	6.	8	15	20

The differences in the residuals brought great changes in the weights. The weight of cotton manufactures increased from 38% to 51% and that of cement fell from 31% to 15%. There are only minor changes in the others. The coefficient of correlation between the individual series and the compounded series according to the two systems of weights are given below.

COEFFICIENTS OF CORRELATION

	1st	2nd
i and u	0.927	0.946
i „ v	0.736	0.691
i „ w	0.816	0.853
i „ x	0.897	0.944
i „ y	0.827	0.847

We notice that except in the case of jute there is an increase in correlation between i and the different series in the 2nd system of weights. This is specially significant in the case of cement because its weight has come down considerably. This shows that the new system of weights is reasonable, and all the series except jute show a very high correlation, the order being cotton manufactures, cement, pig-iron, coal, and jute. S^2 has come down from 15,522 to 11,363 showing that the fluctuations of the 2nd index are less violent than the first.

We may compare this system of weights with those given in *Capital*.

	u	v	w	x	y
Ours	51	6	8	15	20
<i>Capital</i>	26	17	23	14	20
Ratio	0.5	2.8	2.9	0.9	1.0

We find that the weights of cement and coal in the two systems are almost equal, *Capital's* index for cotton is half of ours, and its weights for jute and pig-iron are nearly 3 times those of ours. This shows that when compared with ours, they have under-estimated the weight of cotton manufactures and over-estimated those of jute and pig-iron. Let us examine their basis for assigning weights which was explained in the issue of *Capital* of 17-3-1938. "The meagre basis, in the form of net output value of industries for the allotment of weights to different industries on prescribed lines is not possible in India owing to the absence of any census of pro-

duction. In the circumstances we have based our system of weighting on considerations of gross output value as estimated from the returns of production and price, the volume of production, the size of the industry (as indicated by the amount of capital invested in it)." We notice from the above that great reliance has been put on the gross output and the capital of the industry. If there are no rapid changes in the structure and organisation of an industry, the gross output of the industry bears to the net output a relation which changes only very slowly with time. But this relationship will be different for different industries. Thus in the cement industry the net output may be more than 80% of the gross output, whereas in the textile industry it may not be more than 50 or 60%. Hence if we assign weights according to the gross output it may distort them. But changes in gross output measure changes in the productivity of particular industries with considerable precision subject to the reservations noted above. Similar difficulties arise in the case of capital also with the added problem of distinguishing between fixed and working capital. But for want of any other information, the gross output figures may serve as a rough guide. Another defect of these weights is the different intensities of fluctuations during the periods of boom and depression. The period under consideration comprises of the depression period 1932-34, later recovery period and final boom period of 1937. Further while the other four industries are dependent on the home market, the fortunes of jute industry depend to a considerable extent on the state of world trade and the consequent foreign demand for it. That is why it does not move quite parallel with other industries, and is not a good indicator of the industrial trend in the country which to a very large extent depends on internal market conditions. This explains the low weight attached to the jute industry, though it is the second biggest industry in India from all considerations, namely, capital, number of people employed and value of output. Let us compare the indices of production obtained by these two systems of weights. We will find that up to 1935 the graph of the indices based on the weights adopted by the *Capital* was below that of ours and afterwards above. (Vide p. 137. The former period was the depression period and the latter the revival and boom periods. During the depression jute production was very low, and in the later period it recovered very fast. Thus the greater fluctuations in the indices of production according to the weights given in the *Capital* were mainly contributed by jute. It is true that other commodities like pig-iron and cement also showed wide fluctuations but that of jute masked them to a greater extent. But the long-term movement is shown equally well in both. In this connection we may recall "the well-known principle that very great precision in weighting is not essential to secure a general index number of satisfactory exactitude from a number of partial indices which are themselves reliable in character."¹

WEIGHTS ON THE BASIS OF OUTPUT

Though no census of production is taken in India, a rough estimate of the value of net output can be obtained in the case of the protected indus-

1. *Indices of Industrial Productive Activity*, J.R.S.S. 1927.

tries on the basis of the reports of the Tariff Boards. In assessing the extent of protection necessary, the Board has to estimate the fair selling price of the commodity and the difference between the cost of imported goods ex-duty and the fair selling price is the amount of protection recommended. The fair selling price is determined by adding to the works-cost of the material, normal profits, over-head, depreciation, etc. "It was explained that the term works-cost was meant to exclude the cost of raw cotton and also such charges as depreciation, commission of managing agents and interest on working capital. Income and super taxes were also to be excluded."¹ In the census of production of 1930 in England, gross output represented the value of the goods in the form in which they were sold and the net output was the figure which resulted from deducting the aggregate "cost of materials used," from the gross output and eliminating depreciation. "Thus this figure represents the value added to materials by the industrial processes and after allowances for a sum sufficient to cover the depreciation of plant and machinery constitutes the fund from which wages, salaries, rent, royalties, rates and taxes, advertisement and selling expenses and all other similar charges have to be provided as well as profits."² Hence if we add to the works-cost of the Tariff Board, their estimated over-head charges and normal profits we get a figure which roughly gives an idea of the net output. This at once shows us a way of getting out of the difficulty.

But this method suffers from two important shortcomings. The first is that the net output is not the aggregate of all the individual establishments of the industry, but those which would be got from "typical mills." For each industry, the Board fixes up a particular mill of optimum size and they estimate the average cost of a unit of the product of the typical mill. Hence the net output got by valuing the total output at this price will not be the actual net output. "In selecting the mills whose costs may be regarded as representative we laid down as an essential condition that the mills should be of reasonable capacity, output and equipment, and further that the mills selected if situated at the same centre should as far as possible represent different groups or managing agents."³ When we know that the mills are of varying sizes with different efficiencies it is not easy to forecast the relation between the net output of these different units and the representative units. Of course in the case of steel industry, since so far the primary Tata's is the concern, it did not matter. But for any industry like cotton with a very large number of units the method does not seem to be feasible. In the case of cement the number of units is very small and separate estimates of each are available. But they were made long before the period under consideration and will not be useful for the present purpose. There is an additional difficulty in the case of cotton industry. Protection is mainly required for the higher qualities of cloth and the net output for those varieties is high. But their share in the total production is not considerable. If we estimate the net output on the basis of these figures we will get an

1. Report of the Indian Tariff Board on Cotton Industry, 1932
2. Final Report on the Fourth Census of Production, 1930, Part I.
3. Report of the Indian Tariff Board on Cotton Industry, 1932.

inflated value of net output. But even these rough estimates are not available for jute because it is not a protected industry. From these considerations, and in view of the fact that it is not possible to estimate the net output of the two great textile industries within reasonable limits, it is better to assign weights according to the gross output. The advantage is that these two industries form such a high proportion of the total (the proportion of the gross to net outputs is not very different as between the two) that there will be no serious error in this method and we can calculate the indices by this method as well.

We can find the unweighted geometric means of the index relatives also to give an idea of the general trend of production.

THE PRECISION OF THE DIFFERENT SETS OF INDEX NUMBERS

Now we can compare these four sets of index numbers—got by systems of weights according to (1) Dr. Rhodes' method, (2) *Capital* (3) output, and (4) unweighted geometric mean—and judge their relative efficiencies by some measure of precision. For this purpose the following method due to Dr. Rhodes is followed.¹ The series of index numbers according to the four methods are given in the Appendix.

The four index numbers noted above attempt to measure the same quantity, namely, the industrial activity. Let X_t be the index according to the 1st method, Y_t according to the 2nd, Z_t according to the third and U_t according to the fourth method respectively and let the real value of the index be I . Then $X_t = r_x I_t + A_t$ where r_x gives the linear relation between X_t and I_t , and A_t represents the residual factor due to the errors of computation of the index. Similar relations can be given for the other index numbers (Y_t , Z_t and U_t). If we measure the deviations from the arithmetic means

$$x_t = r_x i_t + a_t$$

$$y_t = r_y i_t + b_t \text{ etc.}$$

We can suppose that the error terms $S a_t i_t$ and $S a_t b_t$ etc., are zero, Then, $S x_t y_t = r_x r_y S i_t^2$; $S x_t z_t = r_x r_z S i_t^2$,

if we put $r_x \sqrt{S i_t^2} = R_x$ etc., we get

$$R_x \times R_y = Sxy;$$

$$R_y \times R_z = Syz$$

$$R_x \times R_z = Sxz;$$

$$R_y \times R_u = Syu$$

$$R_x \times R_u = Sxu;$$

$$R_z \times R_u = Szu$$

Taking logarithms and adding three by three

$$3 \log R_x + \log R_y + \log R_z + \log R_u = \log Sxy + \log Sxz + \log Sxu \quad I$$

$$\log R_x + 3 \log R_y + \log R_z + \log R_u = \log Sxy + \log Syz + \log Syu \quad II$$

and 2 other similar equations.

Adding the four equations and dividing by 6 we get

$$\log R_x \times \log R_y \times \log R_z \times \log R_u = \frac{1}{6} (\log Sxy + \log Sxz + \log Sxu + \log Syz + \log Syu + \log Szu).$$

From the above five equations the values of R_x , R_y , R_z and R_u can be calculated.

1. E. C. Rhodes *The Precision of Index Numbers*, J.R.S.S., Vol. 99, pp. 142-46,

Now $Sx_t^2 = R_x^2 + Sa_t^2$, etc.

∴ $Sa_t^2 = Sx_t^2 - R_x^2$ with similar expressions for b_t^2 , c_t^2 and d_t^2 . We take the value of R_x etc., obtained by the method as approximate, and obtain more accurate values of the quantities by the following method :

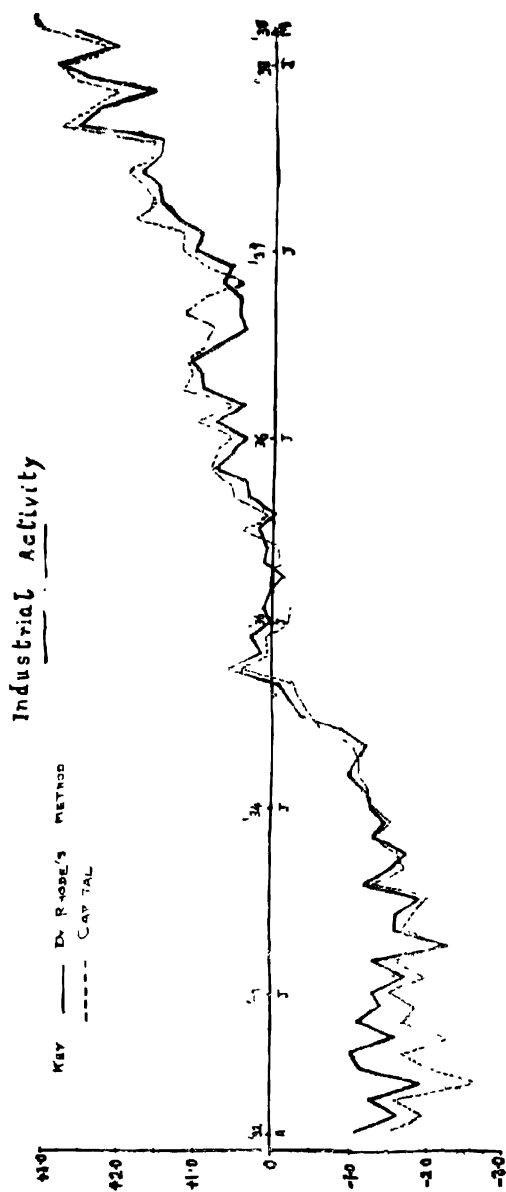
$$R_x^1 = R_x + Px, R_y^1 = R_y + Py \text{ etc.}$$

Substituting these values in the equations we get

$P_x R_y + P_y R_x = S_{xy} - R_x R_y$ neglecting $P_x P_y$ being too small. Thus we get six equations and from these six the values of the four quantities P_x , P_y , P_z and P_u can be estimated by the method of least squares. This gives more accurate results. From the data worked out above we get the following result.

		Difference
$S_{xy} = 12800$	$R_x \times R_y = 12844$;	- 44
$S_{xz} = 11464$	$R_x \times R_z = 11230$;	234
$S_{xu} = 13257$	$R_x \times R_u = 13403$;	- 146
$S_{yz} = 12657$	$R_y \times R_z = 12796$;	- 139
$S_{yu} = 15400$	$R_y \times R_u = 15179$;	221
$S_{zu} = 13307$	$R_z \times R_u = 13354$;	- 47
$Sx_t^2 = 11363$; $R_x^2 = 11342$; $a_t^2 = 21$; $S_a^2 = 0.2917$; $S_a = 0.540$		
$Sy_t^2 = 14811$; $R_y^2 = 14546$; $b_t^2 = 265$; $S_b^2 = 3.6806$; $S_b = 1.918$		
$Sz_t^2 = 11461$; $R_z^2 = 11257$; $c_t^2 = 204$; $S_c^2 = 2.8333$; $S_c = 1.683$		
$Su_t^2 = 17022$; $R_u^2 = 15839$; $d_t^2 = 1183$; $S_d^2 = 16.4306$; $S_d = 4.053$		

From the above results we find that the indices obtained by Dr. Rhodes' method are most precise, and the unweighted G. M. least precise. Gross production weights come second in order followed by the weights given in the *Capital*. It should be noted that the standard error of the indices of the *Capital*, is nearly four times that of those obtained according to Dr. Rhodes' method. The differences in the dispersions of the different series of indices can be explained as follows: During the depression period the values of the 4th method are the lowest followed by the *Capital's*, and Rhodes' and gross output in order. This is due to the fact that in the first (i.e. 4th method) no weights are given and the greater fall in the production of jute, pig-iron and cement pulls down the index; the *Capital's* index gives a comparatively greater weightage to those three commodities and hence they also show a greater fall. But the last two indices (Dr. Rhodes' method and the gross output) give greater weight to cotton which has not fluctuated to such great extent as the others, and hence the indices are not so low. In the revival and boom periods we notice the complementary effect, the order of the values following in the reverse direction, unweighted G. M. highest, followed by the *Capital's*, Dr. Rhodes' and gross production. This is due to the fact that those industries which suffered worst during depression recovered rapidly during the revival and boom periods. Thus the indices obtained by Dr. Rhodes' method come in between the two sets and give the greatest precision as noted above.



		Dr. Rhodes' method.	Capital.	Net output	Simple G. M.
April	1932.	- 10.9	- 15.0	- 10.3	- 18.4
May	"	- 15.9	- 18.4	- 15.9	- 21.4
June	"	- 12.1	- 15.6	- 10.5	- 20.6
July	"	- 18.6	- 25.7	- 18.2	- 33.2
August	"	- 11.0	- 19.3	- 11.5	- 23.6
September	"	- 9.8	- 16.1	- 10.4	- 19.6
October	"	- 15.6	- 22.0	- 16.5	- 26.2
November	"	- 10.8	- 16.1	- 9.9	- 21.1
December	"	- 13.6	- 17.6	- 12.7	- 21.6
January	1933.	- 12.6	- 14.7	- 11.4	- 17.8
February	"	- 17.3	- 19.0	- 14.8	- 22.2
March	"	- 12.8	- 15.5	- 9.8	- 18.9
April	"	- 21.9	- 21.3	- 19.9	- 24.5
May	"	- 15.4	- 16.3	- 13.4	- 18.7
June	"	- 16.4	- 17.5	- 13.1	- 21.5
July	"	- 18.3	- 19.3	- 17.7	- 23.5
August	"	- 11.9	- 12.3	- 12.0	- 14.8
September	"	- 15.0	- 16.5	- 16.5	- 19.1
October	"	- 16.8	- 15.9	- 15.1	- 19.0
November	"	- 12.4	- 12.6	- 12.2	- 15.1
December	"	- 14.1	- 14.2	- 15.6	- 17.2
January	1934.	- 12.7	- 12.2	- 14.6	- 13.7
February	"	- 11.9	- 11.3	- 11.7	- 13.7
March	"	- 9.5	- 10.9	- 10.3	- 13.6
April	"	- 10.7	- 10.7	- 11.6	- 12.9
May	"	- 11.8	- 9.8	- 11.1	- 10.3
June	"	- 8.2	- 6.1	- 9.7	- 9.6
July	"	- 3.6	- 4.7	- 6.9	- 6.9
August	"	- 2.0	- 3.5	- 3.7	- 6.3
September	"	- 0.9	- 2.6	- 4.1	- 5.8
October	"	5.5	4.1	1.6	1.1
November	"	1.6	0.9	- 0.4	- 2.3
December	"	2.5	0.7	- 0.1	- 2.8
January	1935.	0.4	- 2.0	- 0.8	- 5.7
February	"	1.2	- 2.4	- 1.5	- 2.2
March	"	0.3	- 0.0	- 1.4	- 2.8
April	"	- 1.1	0.1	0.7	- 1.4
May	"	1.1	- 0.9	0.1	- 3.8
June	"	0.5	- 0.5	- 2.8	- 2.5
July	"	1.3	3.7	0.3	- 1.6
August	"	- 0.2	0.6	- 1.7	- 2.1
September	"	2.8	4.8	- 0.1	3.2

	Dr. Rhodes' method.	<i>Capital.</i>	Net output	Simple G. M.
October 1935.	3.1	5.6	2.0	6.2
November "	7.3	7.7	2.6	5.0
December "	5.3	7.1	2.1	5.1
January 1936.	3.2	5.7	1.3	2.6
February "	7.2	9.3	3.8	7.3
March "	3.7	5.0	2.9	2.8
April "	8.9	11.4	10.9	10.0
May "	9.3	10.3	8.4	8.1
June "	10.4	12.4	12.0	10.7
July "	6.7	8.8	10.7	7.7
August "	3.6	7.5	6.5	6.1
September "	4.1	11.1	11.1	6.2
October "	4.0	7.6	8.1	6.5
November "	6.3	4.1	5.2	3.9
December "	4.9	8.9	10.9	7.7
January 1937.	9.9	11.5	13.5	10.2
February "	9.1	11.6	12.5	9.6
March "	12.2	17.9	14.1	15.2
April "	14.0	15.2	10.7	13.3
May "	14.7	16.4	13.7	14.8
June "	16.9	18.9	20.3	17.9
July "	14.8	15.9	17.0	11.6
August "	14.2	15.9	16.8	15.5
September "	25.1	26.9	25.9	26.2
October "	22.5	23.7	18.9	22.2
November "	15.7	20.3	18.7	19.5
December "	23.9	25.4	24.0	24.9
January 1938.	27.9	27.6	23.9	33.1
February "	20.2	21.7	19.1	20.5
March "	25.8	28.6	29.5	27.2

INDUSTRIAL FLUCTUATIONS

In the previous chapter, some methods of measuring industrial productive activity have been examined in detail. But the discussion therein centred on the monthly indices of a short period of six years only. Though such indices are useful for short-term studies, an Annual Index is necessary for studying the trends of the contribution of industry to the National Income over a period of time, and also to include some important industries which are mainly seasonal. The method of construction of this index follows closely on the lines of the monthly index, the figures of annual production taking the place of the monthly figures. Extending the analogy further, just as we have to correct the monthly figures for seasonal

variations, we have to correct the annual figures for the secular trend. This is necessary because, when explaining the fluctuations from the monetary or other factors, we must take into account the normal change in the amount of production of a commodity over a period of time, due to the changes in the population, standard of living, industrial and fiscal policy of the Government, etc. The secular trend is ordinarily represented by an algebraic expression say a parabola of the 2nd or higher order, which gives a good fit to the data. The ratio of the observed to the expected values expressed as a percentage gives the volume of production in any year corrected for the secular trend. If the rate of change is great it may be useful to find the logarithmic trend, i.e., to fit a curve to the logarithms of the data. Further these logarithmic curves show the relative rate of change in production whereas the other gives only absolute rate of change. The weighted average of these individual values for the different industries gives the adjusted index of industrial activity. But here the most appropriate weights are those based on net production.

When fitting a curve, for eliminating the secular trend, care must be taken to see that the progress during the whole period is more or less uniform, because at certain periods of time there will be discontinuity in the economic system, and the rates of changes alter very much for the better or worse. In such cases, it is better to split the whole period into the component parts. For example, the pace of industrial production in India increased more rapidly in the post-war period (1919-38) than in the previous period (1900-19). Hence in analysing the fluctuations for the different industries, one curve is fitted for the former and another for the latter period. This sub-division is useful in another respect. Before 1919, cotton, jute, coal and paper were the only important large-scale industries; cement and iron and steel came to prominence only during and after the great war of 1914-18, and sugar after 1931. Also Government launched on the policy of discriminating protection only after 1923 when the first Tariff Board was appointed. All these different factors led to a faster rate of development of industries during the twenties and thirties of this century. Thus the splitting of the whole period is useful for this purpose also.

TRENDS OF PRODUCTION

In the accompanying table expressions for the trends of production of different industries during the pre-war and post-war periods are given. Both ordinary and logarithmic curves are fitted to measure the absolute as well as relative rate of change of production. (The actuals and expected values of production of each industry in different years and the values of former as a percentage of the latter, are given at the end of the chapter.)

GENERAL TREND

Cotton (piecegoods millions of yds.)

$$\text{Pre-war } Y = 974.31 + 65.1543\xi_1 + 0.784\xi_2$$

$$\text{Post-war } Y = 2413.167 + 125.029\xi_1 + 5.257\xi_2$$

Jute (Raw jute 000 maunds)

$$\begin{aligned}\text{Pre-war } Y &= 19.637 + 0.867\xi_1 - 0.002\xi_2 \\ \text{Post-war } Y &= 25.189 - 0.075\xi_1 - 0.017\xi_2\end{aligned}$$

Coal (millions of tons)

$$\begin{aligned}\text{Pre-war } Y &= 12.374 + 0.775\xi_1 + 0.021\xi_2 \\ \text{Post-war } Y &= 21.272 + 0.155\xi_1 - 0.009\xi_2\end{aligned}$$

Paper (000 tons)

$$\begin{aligned}\text{Pre-war } Y &= 25.121 + 0.746\xi_1 + 0.022\xi_2 \\ \text{Post-war } Y &= 35.706 + 1.355\xi_1 + 0.063\xi_2\end{aligned}$$

Steel (000 tons)

$$\text{Post-war } Y = 365.493 + 35.70\xi_1 + 0.586\xi_2$$

Cement (000 tons)

$$\begin{aligned}\text{Post-war } Y &= 471.556 + 49.228\xi_1 + 0.633\xi_2 \\ \text{Pre-war } \xi_1 &= (x - 1909); \quad \xi_2 = (\xi_1^2 - 30) \\ \text{Post-war } \xi_1 &= (x - \text{middle of } 1926 \text{ \& } 1927) \quad \xi_2 = \xi_1^2 - 26.9\end{aligned}$$

LOGARITHMIC TREND

Cotton

$$\begin{aligned}\text{Pre-war } \log Y &= 2.9660 + 0.0309\xi_1 - 0.0007\xi_2 \\ \text{Post-war } \log Y &= 3.3658 + 0.0224\xi_1 - 0.0005\xi_2\end{aligned}$$

Jute

$$\begin{aligned}\text{Pre-war } \log Y &= 1.2785 + 0.0198\xi_1 - 0.0004\xi_2 \\ \text{Post-war } \log Y &= 1.3976 - 0.0015\xi_1 - 0.0003\xi_2\end{aligned}$$

Coal

$$\begin{aligned}\text{Pre-war } \log Y &= 1.0645 + 0.0287\xi_1 - 0.0005\xi_2 \\ \text{Post-war } \log Y &= 1.3266 + 0.0053\xi_1 - 0.0142\xi_2\end{aligned}$$

Paper

$$\begin{aligned}\text{Pre-war } \log Y &= 1.3938 + 0.129\xi_1 + 0.0002\xi_2 \\ \text{Post-war } \log Y &= 1.5425 + 0.0165\xi_1 + 0.0007\xi_2\end{aligned}$$

Steel

$$\text{Post-war } \log Y = 2.4914 + 0.0485\xi_1 - 0.0017\xi_2$$

Cement

$$\text{Post-war } \log Y = 2.5770 + 0.0585\xi_1 - 0.037\xi_2$$

Sugar

$$\begin{aligned}\text{Post-war } \log Y &= 2.2256 + 0.0710\xi_1 + 0.0061\xi_2 \\ &\quad \xi_1 \text{ and } \xi_2 \text{ same as before.}\end{aligned}$$

From the above equations we find that all the industries have been recording increased output from year to year, the only exception being jute in the post-war period. In cotton and paper industries, the absolute

rate of increase in the post-war period was nearly double that of the pre-war period ; in coal industry this absolute rate slowed down to a fifth of the pre-war level and in jute there was a reversal though it was very small. The two new industries, steel and cement showed rapid rates of increase in the post-war period. If we turn our attention to the relative rates of increase, we find that in post-war period, cement and steel showed the highest rates 6% and 5% nearly, followed by cotton and paper, the former with slightly above and the latter below 2% ; the rate of increase in coal was less than 1% ; and in jute the rate of decrease was very small. In the pre-war period the rate of increase of cotton was highest with slightly more than 3% ; coal came next with a little below 3% ; and they were followed by jute with slightly less than 2% and paper with a little above 1%. Thus compared with the post-war period, the pace slowed down in cotton and coal and was reversed in jute, while paper showed a greater rate of increase than in the previous period. These different facts can very easily be explained. Steel and cement being new industries, recorded greater rates of increase the former with the help of tariff protection. For the same reason paper which received protection from 1926 showed greater rate of increase in the post-war period. As regards cotton, the weaving section came to prominence only in the early years of this century and hence the rate of production increased rapidly. But later, it slowed down and the stimulus by protective tariffs came only after 1930 ; but by that time the magnitude of production was very high and hence the rate of increase was not very great. Coal industry came to prominence by increased uses for industrial and transport purposes in the first two decades of the century. But later the development of electricity gave a check to its expansion. Jute also expanded very rapidly in the last quarter of the nineteenth century and till the end of the great war of 1914-18. But later it reached the saturation level and in fact agreements between producers for restriction of output were entered into.

FLUCTUATIONS OF PRODUCTION

The following tables show the fluctuations of production in different industries, during the pre-war and post-war periods. For convenience, they are expressed in terms of the standard deviation of each as unit, and represented in the accompanying graphs. From the value of standard deviations of fluctuations, we find that they were very small in the pre-war period all being more than 4 and less than 6.5 but during the post-war period they were much high, the greatest being for steel and the least for cotton. The change in standard deviation was least in cotton and highest in jute and paper. In coal the change was only slight.

PRE-WAR

Cotton :—The epoch started with production slightly below the normal followed by a prosperous year. In the subsequent four years the production was almost normal, being slightly below it in 1902, and above it in 1904. From 1906 to 1908 production was below normal; and this period was followed by four prosperous years. But the pre-war year and the first year of war were lean years followed again by three prosperous years. The closing of war was again marked by decline.

Jute:— In the first seven years except 1905, the production was just normal or slightly above it. In 1908 it was again slightly below normal followed by a very prosperous year. From 1910 to 1914 it was just normal or below it. Again the war period was prosperous and was followed by recession in 1918.

Coal:— The first six years were lean years except 1902 when it was slightly above normal. From 1906 to 1909, the industry was in a prosperous condition; followed by two lean years. Again the production was above normal for four years followed by two years below normal.

Paper:— The first three years were prosperous followed by four lean years. From 1907 to 1912 the production was again above normal and in the succeeding four years it was at a low ebb. 1917 was again normal and was followed by a prosperous year.

Aggregating the four industries, we find on the whole that there was no definite trend of business activity. The composite index, giving weights either according to the *Capital* or unweighted arithmetic mean, shows fluctuations from year to year. But the magnitude of these fluctuations was very small being always less than 7% and in many instances less than 2%. The standard deviation of these fluctuations was 3.5 for the first and 2.8 for the second case.

POST-WAR

Cotton:— Here again, we notice year to year fluctuations without any definite trends; but the magnitude of these fluctuations became higher, the worst being in the year 1928, when on account of the great general strike in Bombay, the industry in that centre was paralysed for a greater part of the year. Though tariff protection was given in 1932, the total production being much greater compared with that of the classes of goods requiring protection, it did not have any influence on the fluctuations of total production.

Jute:— From 1920 to 1926 it was depressed except in the year 1924. But the worst year was 1920 and since then the trend had been upward crossing 100 in 1927 and reaching the peak in 1930. Again there was a setback reaching the nadir in 1933. From 1934 production again revived.

Steel:— From 1919 there was a falling tendency reaching the minimum in 1922; afterwards, there was a rising tendency reaching the maximum in 1927. From 1928 to 1934 production was always below normal. Afterwards it was slightly above normal.

Paper:— From 1920 there was a falling tendency reaching the minimum in 1922. Afterwards there was a rising tendency reaching the normal in 1926 and maximum in 1929. Subsequently there was a fall and production was below normal from 1932.

Cement:— From 1920 to 1924 production was below normal. In the subsequent four years, it was above normal, again for five years, it was below normal due mainly to depression and since 1935 it again went up.

Coal:— There was a sharp fall in production from 1919 to 1920, and mild fluctuations till 1923 after which there was a rising trend. There was again a falling tendency from 1930; and the years 1932 and 1933 were below normal. There was revival later.

If we aggregate these different fluctuations by the simple arithmetic mean, and the weighted arithmetic mean, weights being given according to *Capital* or Dr. Rhodes' method, we find that this period exhibits certain interesting trends. The war boom continued in 1919 also, but with the rapid competition of imports, the industrial activity was in a depressed condition from 1920 to 1924. From 1925, there was revival due partly to the tariff protection for different industries, and this continued till the great depression of 1930 except for 1928, when due to strikes in the two major industries of cotton and steel the production was below normal. The nadir of the depression was 1933, and in the subsequent year, there was a sudden jump to normal and later to above normal level. Thus during this short period of 18 years there were two depressions and two revivals.

Though sugar industry is the third biggest at present, from the point of view of either capital, number of people employed or value of production, it is not included in the above discussions, because it grew rapidly only during the last five years of the period, and a trend curve fitted to the whole period does not reflect the true state of affairs. In fact, fitting with the ordinary and logarithmic curves, it was found that the former gave a very bad fit in the pre-protection period, and the latter, though not very unsatisfactory, showed bad fit towards the end of the period under consideration. The relative rate of increase was, by this method, found to be about 7%.

FLUCTUATIONS ABOUT THE GENERAL TREND IN TERMS OF STANDARD DEVIATION

Year.	Cotton.	Jute.	Coal.	Paper.
1900	-0.16	0.16	-1.06	1.14
1901	1.89	0.00	-0.71	1.14
1902	-0.32	0.16	0.18	0.46
1903	0.00	0.00	-1.06	1.38
1904	0.79	0.16	-0.18	-1.38
1905	0.00	-1.27	-1.06	-2.29
1906	-1.10	0.16	0.35	-1.38
1907	-0.32	0.32	1.42	0.92
1908	-1.42	-0.63	2.84	0.92
1909	0.16	2.22	0.18	0.23
1910	0.32	-0.48	-0.71	0.92
1911	0.79	-1.90	-0.89	0.46
1912	0.95	0.00	0.53	0.00
1913	-0.79	-0.79	1.24	-0.46
1914	-1.90	0.00	0.35	0.00
1915	0.79	2.06	0.00	-0.46
1916	1.42	1.11	-0.89	-0.92
1917	0.95	0.00	-0.89	0.00
1918	-1.42	-1.43	0.18	1.15
S. D.	6.35	6.30	5.65	4.38

FLUCTUATIONS ABOUT THE LOGARITHMIC TREND IN TERMS OF STANDARD DEVIATION

Year.	Cotton.	Jute.	Coal.	Paper.
1900	-0.70	0.08	0.22	1.13
1901	0.93	0.02	0.08	1.10
1902	-0.29	0.20	0.70	0.51
1903	0.14	0.10	-0.90	-1.39
1904	1.13	0.20	-0.45	-1.24
1905	0.13	-1.23	-1.44	-2.16
1906	-1.06	0.25	0.10	-1.28
1907	-0.18	0.47	1.17	1.07
1908	-1.11	-0.57	2.77	0.99
1909	0.31	2.25	-0.19	0.42
1910	0.47	-0.40	-1.27	1.08
1911	0.81	-1.88	-1.38	0.52
1912	0.95	-0.02	0.28	0.13
1913	-0.89	-0.83	1.09	-0.45
1914	-2.16	0.05	0.05	0.05
1915	0.87	2.06	-0.02	0.54
1916	1.60	1.20	-0.79	0.79
1917	1.13	—	0.74	-0.08
1918	-1.44	1.32	0.59	-1.27
S. D.	5.61	6.33	5.07	4.49

FLUCTUATIONS ABOUT THE GENERAL TREND IN TERMS OF STANDARD DEVIATION

Year.	Cotton.	Jute.	Steel.	Coal.	Cement.	Paper.
1919	0.46	-0.38	0.96	2.30	1.96	1.7
1920	-0.46	0.30	-0.36	-1.54	-1.04	0.9
1921	0.46	-1.36	-1.14	-0.61	-0.98	0.4
1922	-0.15	-0.68	-2.29	-1.07	-1.53	-1.9
1923	-0.92	-0.15	-1.33	-0.61	-0.31	-1.3
1924	0.62	-0.76	0.24	0.15	-0.68	-1.8
1925	-0.31	0.53	1.14	-0.15	0.61	-1.0
1926	1.23	0.60	1.45	-0.15	1.23	0.0
1927	1.08	1.06	1.39	0.46	1.66	0.2
1928	-2.93	1.44	-1.51	0.61	1.35	1.2
1929	-0.31	2.04	0.18	1.23	0.25	1.6
1930	-0.31	-0.76	-0.06	1.38	-0.25	0.6
1931	1.23	-1.21	0.30	-0.15	-0.92	0.4
1932	1.23	-1.06	-0.85	-1.23	-0.86	-0.4

Year.	Cotton.	Jute.	Steel.	Coal.	Cement.	Paper
1933	-0.92	-1.14	—	-1.54	-0.80	0.0
1934	0.46	-0.83	0.36	-0.00	-0.12	-0.2
1935	0.31	-0.23	0.42	-0.61	0.31	0.0
1936	-0.62	1.29	0.12	-0.31	-0.61	-0.4
S. D.	6.49	13.22	16.62	16.28	6.51	8.33

FLUCTUATIONS ABOUT THE LOGARITHMIC TREND IN
TERMS OF STANDARD DEVIATION.

Year.	Cotton.	Jute.	Steel.	Coal.	Cement.	Paper.
1919	0.64	0.11	1.27	—	0.47	1.55
1920	-0.44	0.47	0.13	0.33	-1.01	0.72
1921	0.39	-1.28	-1.17	0.57	-0.24	0.30
1922	-0.26	-0.72	-1.49	-0.54	-0.93	-1.84
1923	-1.04	-0.15	0.90	-0.66	0.52	-1.21
1924	0.50	0.64	0.67	-0.63	-0.09	-1.57
1925	-0.32	0.36	1.50	-0.81	1.18	-0.75
1926	1.22	0.43	1.72	-1.13	1.54	0.19
1927	1.11	0.85	1.85	-0.60	1.71	0.43
1928	-2.77	1.25	-1.42	-0.51	0.53	1.40
1929	-0.14	1.85	0.12	0.05	-0.11	1.76
1930	-0.12	-0.90	-0.15	0.34	-0.72	0.87
1931	1.41	-1.29	-0.43	-1.09	-1.41	0.55
1932	1.37	-1.11	-0.94	2.00	-1.31	-0.20
1933	-0.73	-1.11	-0.15	2.02	-1.13	0.06
1934	0.44	-0.61	0.15	0.15	-0.12	-0.34
1935	0.18	0.17	0.28	1.42	0.71	-0.28
1936	-0.42	1.97	0.20	1.79	1.63	-0.77
S. D.	6.57	12.76	17.01	14.70	10.36	8.71

ANNUAL INDEX NUMBERS OF INDUSTRIAL PRODUCTION

Year.	Simple A. M.	Capital.	Year.	Dr. Rhodes' method.	Capital.
1900	99.8	100.6	1919	111.4	111.0
1901	103.3	105.2	1920	94.6	95.2
1902	100.5	100.2	1921	95.9	92.7
1903	97.0	97.6	1922	89.4	86.4
1904	99.5	100.1	1923	92.1	92.5
1905	94.0	94.6	1924	99.4	100.7
1906	97.5	96.3	1925	101.7	103.9

Year.	Simple A. M.	<i>Capital</i>	Year.	Dr. Rhodes' method.	<i>Capital.</i>
1907	103.0	101.4	1926	109.3	109.5
1908	101.8	98.8	1927	111.1	112.1
1909	104.3	104.1	1928	96.0	99.6
1910	99.8	100.6	1929	103.8	107.8
1911	103.5	98.9	1930	99.4	99.3
1912	102.3	101.3	1931	99.9	96.5
1913	98.8	97.3	1932	98.1	93.8
1914	97.5	95.7	1933	92.7	92.0
1915	104.0	105.5	1934	100.6	99.3
1916	101.8	105.4	1935	102.7	102.5
1917	100.3	101.1	1936	101.0	103.7
1918	97.0	93.3			
S. D.	2.8	3.5			

Chapter VI

LABOUR

AN account of the geographical distribution of industrial labour in India as also the distribution according to the industries has been given in an earlier chapter. It is proposed to consider here the growth of trade unionism among labourers and the incidence of industrial disputes in the country. In addition, information regarding standard of living of the workers is also given.

1. TRADE UNIONISM

Though sporadic attempts were made in India since the eighties of the 19th century, for the organisation of labour, they did not survive long and trade unionism did not take firm root in the country till after the closing years of the great war of 1914-18. In the two or three years following the close of the war a large number of these organisations were started and though most of them had a high infantile mortality, the course of the movement in general gained strength and vitality in course of time. The agitation for statutory recognition of trade unions arose out of a legal action against Mr. B. G. Wadia, the President of the Madras Labour Union of the Buckingham Mills. The subsequent growth and strength of the movement were derived by strong economic and political factors. The rising costs of living in the quinquennium starting with 1917 and the huge profits made by the industrialists during the same period prompted the labourers to demand higher wages, bonuses, etc., and this led to severe friction between capital and labour. Naturally the labour leaders found it necessary to organise the workers in strong unions in order to make their demands effective. The establishment of an International Labour Office and India's close association with it gave inspiration and hope for this movement. In earlier years the illiteracy of labourers, their migratory character (with the agricultural bias) and contact with villages were chiefly responsible for the lack of class consciousness in the workers. To add to this were the well-known religious, sectarian and other differences among the workers. Moreover, there was lack of leadership and newspapers for ventilating their grievances. But with the gradual development of industries a definite class of workers depending mainly on organised industries grew up especially in big cities like Bombay, Ahmedabad, Calcutta, Madras, Canmpore, etc., and the recruitment of educated people for the higher classes of salaried posts brought consciousness and leadership also. In addition, the increased political consciousness in the country after 1920, when the leaders of the Indian National Congress began to take greater interest in the problems affecting labour population made the political leaders take increasing interest in the labour classes. Following the trend in other countries both the public and newspapers have been devoting greater attention to the labour prob-

lems, and this gave an impetus for the labourers to organise themselves and put forth their demands.

The first Indian Trade Unions Act was passed in 1926 and came into force from 1927, and under it statistics of trade union membership are compiled according to the different provinces and industries. Unfortunately these returns are not compulsory and so a number of registered trade unions even do not send their reports. Hence the statistics of different years are not strictly comparable. But as will be shown underneath the proportion of those sending to the total number is fairly high; and as only a few of the smaller organisations do not send, an idea of the general trend of membership can be obtained from the published figures. But no information is available regarding the unregistered unions.

The following table gives the distribution of trade unions in Bombay the premier centre for the movement according to membership on specified dates.¹

Size	June 1926		March 1930		June 1936		June 1939	
	No. of mem- bers.	Per- centage of total	No. of mem- bers.	Per- centage of total	No. of mem- bers.	Per- centage of total	No. of mem- bers.	Per- centage of total.
Under 50	151	0.3	113	0.1	343	0.4	685	0.5
50 - 100	460	0.9	265	0.2	793	0.8	1878	1.3
100 - 200	1012	1.9	2610	2.1	3509	3.6	4613	3.2
200 - 300	2435	4.6	3637	3.0	4116	4.2	4557	3.2
300 - 500	2327	4.4	5760	4.7	4598	4.7	9293	6.5
500 - 1000	1742	3.3	13803	11.4	7458	7.8	14377	10.0
1000 - 2000	7582	14.2	8964	7.4	5400	5.6	11657	8.1
2000 - 5000	16197	30.4	7125	5.9	18278	18.9	27390	19.1
5000 & over.	21260	40.0	79109	65.2	52217	54.0	68995	48.1
Total.	53166		121386		96712		143445	

The total membership more than doubled between June 1926 and March 1930, but later there was a fall and again an increase. Between June 1926 and March 1930 the group 5000 and above increased at the expense of its neighbour 2000 to 5000. But in subsequent years the largest group recorded a fall both absolutely and relatively and group 2000 to 5000 recovered in numbers though not much in percentage. The fact that throughout the period about 10 per cent. of the members were in unions with a membership of over 2000, shows that the trade unions were maintaining their normal growth which was a satisfactory feature.

The table in the Appendix gives the index number of workers in different industries in British India from 1927-28 with 1930-31 as base and the percentage share of the different industries in the total for four years at an interval of three years from one another. From Table I we notice that the

¹ A study of trade unionism in India, by K. B. Madhava and T. Krishnamurthy, *Sankhya*, Vol V, Part 2, p. 214.

depression affected the membership of almost all the industries, and of late there has been a greater increase in the membership in the miscellaneous group, textiles and printing industries. Workers in municipalities and docks also show a high rate of increase. Engineering industry shows wide fluctuations and seamen show very little change. The great increase in the miscellaneous group can be explained by the large increase of a number of new industries which are classed under this group. Railways which have been the backbone of trade union movement did not show great change perhaps due to the fact that they have been well organised even by 1927-28 and had not much scope for expansion. The tremendous increase noted in the final year may partly be explained by the emergence of popular ministries in the provinces, to whom labourers, in future, have to look to for more and more aid. These differential rates of increase resulted in a fall in the share of the membership of railways by about 60% in the beginning to about 40% and of seamen from 19% to 12%, while the miscellaneous group increased from only 1% to nearly 20%. Even now railways contribute the largest quota to the trade union membership and textiles come next, though in the industrial employment the latter takes the premier place.

Table II in the Appendix gives the changes in the total number as well as the percentage of the workers in each province to the total membership. As is to be expected Bengal and Bombay which are the premier centres of industries take the first two places. But the Punjab which occupies a low place in the large-scale industries occupies the third place here perhaps due to the strong railway union, and Madras occupies the next place. Though the United Provinces come next to Madras, the union membership is smaller than is warranted by the number of industrial workers and the political consciousness of that province. One interesting point to be noted is that while Bombay lost its share from 52.9% in 1927-28 to 19.5% in 1937-38 losing even absolutely in the depression, Bengal and the Punjab gained both absolutely and relatively, the former showing a tremendous increase from 2% in 1927-28 to 37% in 1937-38 and taking the first place, and the latter from 5.8% to 14.5%. The United Provinces and Madras also recorded slight increases. The differential growth in the different provinces may be partly explained by the greater interest taken by the leaders in these provinces for organising labour and partly by the increased impetus given to the labourers in the industries in the miscellaneous group to organise themselves.

But it must be recognised that even in 1937-38 the percentage of the trade union membership to the total industrial population in large-scale factories and mills is barely 20 and if workers should get their due share they must organise themselves further on sound lines.

TABLE I-A INDEX NUMBERS OF TRADE UNION MEMBERS IN IMPORTANT INDUSTRIES

Industry.	1927-28	1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35	1935-36	1936-37	1937-38
1. Railways	45	80	125	100	100	96	77	122	117	93	124
2. Tramways	80	12	190	100	114	85	93	164	60	135	113
3. Textiles	100	86	84	100	137	112	108	124	139	151	363

Industry.	1927 28	1928 29	1929 30	1930 31	1931 32	1932 33	1933 34	1934 35	1935 36	1936 37	1937 38
4. Engineering	—	120	55	100	74	—	—	125	326	100	432
5. Printing	6	10	134	100	57	117	126	223	217	215	259
6. Municipalities	60	76	79	100	91	124	163	228	312	314	378
7. Seamen	42	60	81	100	118	114	99	120	58	53	100
8. Docks	—	81	113	100	103	127	137	141	167	217	284
9. Miscellaneous	9	93	108	100	123	209	208	204	306	448	629
Total.	46	83	111	100	108	108	95	130	122	117	178

TABLE I-B PERCENTAGE OF MEMBERSHIP IN EACH INDUSTRY TO THE TOTAL

Industry.	1927-28	1930-31	1933-34	1936-37.	1937-38
1. Railways	56.9	58.3	47.4	46.0	40.5
2. Trainways	1.7	1.0	1.0	1.1	0.6
3. Textiles	19.0	8.7	10.0	11.1	17.8
4. Engineering	...	0.4	...	0.3	0.9
5. Printing	0.2	1.2	1.5	2.1	1.7
1. Municipalities	1.9	1.4	2.4	4.4	3.0
7. Seamen	19.4	21.0	22.0	9.4	11.8
8. Docks	..	2.5	3.6	4.6	4.1
9. Miscellaneous	1.0	5.5	12.2	21.0	19.6

TABLE II-A INDEX NUMBERS OF TRADE UNION MEMBERS IN DIFFERENT PROVINCES

Province	1927 28	1928 29	1929 30	1930 31	1931 32	1932 33	1933 34	1934 35	1935 36	1936 37	1937 38
1. Bombay	70	71	126	100	91	85	70	...	69	70	101
2. Bengal	4	68	100	100	148	130	143	...	146	156	262
3. Madras	26	45	123	100	115	130	59	...	50	52	134
4. C. P.	49	58	81	100	158	169	207	...	250	142	206
5. Punjab	58	146	265	100	218	220	222	..	645	471	566
Total	46	83	111	100	108	108	95	130	122	117	178

TABLE II-B PERCENTAGE OF MEMBERSHIP IN EACH PROVINCE TO THE TOTAL

Province.	1927-28	1930-31	1933-34	1936-37	1937-38
1. Bombay	52.9	34.3	25.2	20.5	19.5
2. Bengal	2.0	25.2	38.1	33.5	37.1
3. Madras	9.5	16.8	10.4	7.4	12.7

Province.	1927-28	1930-31	1933-34	1936-37	1937-38
4. C. P.	2.1	2.0	4.3	2.4	2.3
5. Punjab	5.8	4.5	10.6	18.2	14.5
6. U. P.	3.1	...	3.8	3.9	6.0
7. Bihar & Orissa	25.0	...	1.9	6.5	1.5

2. INDUSTRIAL DISPUTES IN INDIA: 1921-39

The power of the strike as an economic weapon came to be recognised by Indian workers only during the years immediately after the great war of 1914-18. Though strikes had occurred sporadically on the railways and other branches of industry before this period, they were unorganised due to lack of public support and union among the workers. The chief causes for this apathy were attributed to the migratory character, illiteracy and heterogeneous nature of the labour population drawn from different rural parts and different communities, with less scope for social attachments. The end of the great war brought together several new factors which stimulated the organisation of workers. Social workers and politicians in the country conversant with the labour movements in the different countries of Europe, began to take interest in improving the lot of the workers of this country. The organisation of the International Labour Office gave some stimulus to this new movement. The work of the organisation of trade unions began to gather momentum from year to year; and educative propaganda was carried on among the workers in the different industrial centres. The nationalist press evinced greater interest by prominently publishing the news and supporting the cause of the workers. Apart from these external influences, the huge profits made by the industrialists during the post-war boom period, and the rising cost of living brought about by a sharp rise in commodity prices during that period, associated with the scarcity of labour arising from the expansion of industry and the high mortality in the influenza epidemic—all prompted the workers to demand an increase in their wages. In the early years, i.e., 1919 to 1920, most of the strikes resulted in success for the workers, as the industrialists were making huge profits and were prepared to give a small part to the workers, to avoid any interruption in production. But these successes in their wake raised false hopes, among the workers, of the strike as an unfailing panacea for their demands; and during the period of retrocession of the trade cycle, the successful strikes went down to very low proportions, to the disappointment of the workers and their leaders.

It is proposed to make a statistical analysis of the industrial disputes in British India in the period 1921-39, for which data are available from the publications of the Government of India. This analysis refers to (1) the general character of the strikes, namely, their number, extent and duration with an investigation of the seasonal variation if any, (2) the causes and (3) the results of these strikes.

GENERAL CHARACTER OF THE STRIKES

The period 1921-39 can be sub-divided into three shorter periods: (i) comprising the years 1921-28 when great unrest prevailed among

industrial labourers, and the Government took very little interest in these matters ; (ii) 1929-36, when the Royal Commission on Labour investigated the labour problems and action was taken on their report by the Governments of different provinces and by the Central Government ; and (iii) 1937-39, when Labour came under the control of the popular ministers in the provinces. The following table gives the total number of disputes according to the industries affected as well as the different important provinces, in the above three periods.

TABLE I - A
NUMBER OF DISPUTES
Industries

Industries.	1921-28.	1929-36.	1937-39.	Total.
Cotton and Woollen	730	561	386	1,677
Jute	203	95	169	467
Engineering Workshops	85	35	80	200
Railways (including workshops)	74	34	6	114
Mines	31	11	20	62
Others	475	423	523	1,421
Total	1,598	1,159	1,184	3,941

TABLE I - B
NUMBER OF DISPUTES
Regions

Provinces.	1921-28.	1929-36.	1937-39.	Total.
Bengal	547	253	480	1,280
Bombay	751	522	288	1,561
Madras	94	113	146	353
U. P.	54	41	63	158
C. P.	28	42	40	110
Others	124	188	167	479
All India	1,598	1,159	1,184	3,941

From Table I-A we find that the number of disputes in 1929-36 was considerably less than that in 1921-28, and this was reflected in all sections except the group Others, where the reduction was very small. In comparing the first two periods with the third we have to remember that the length of the last was only three years compared with eight years in the other two. We find that during this period, the number of disputes in all sections except cotton and wool showed very great increase, and even in the latter the average number per year increased compared with the former periods. This led to a fall in the proportion of disputes in cotton and wool from about a

half of the total in the first two periods to about a third in the final ; and the proportion of the miscellaneous group increased from about a third in the beginning to about half in the last period.

Turning our attention to the different regions, we find from Table I-B that while Bombay occupied the first place and Bengal the second in the first two periods, the tables were turned in the final. The other three major provinces also recorded an increasing tendency in the number of disputes. Thus while Bombay, which was formerly considered to be the chief centre of these disputes, was becoming comparatively more pacific, the labourers in the other centres were turning out to be more aggressive. The share of Bombay, in the number of disputes, came down from about a half in the first two periods to about a quarter in the final. The number of strikes in the last three years was almost equal to those of the eight years 1929-36 which was less than that in the first period of eight years. The high share of the textile industries in the number of strikes can be explained by the fact that these were the oldest industries of the country; a very large number of workers were employed in them and the organisation of trade unions was stronger among those workers. As new industries began to develop and take root in the country, similar problems of friction between workers and employers began to arise in them also. Bombay and Bengal, being the oldest and most important centres of large-scale industry, naturally figured prominently in the disputes also.

The following table gives the total number of disputes, men involved and working days lost in all industries in the whole of India from 1921 to 1939.

TABLE II

Year.	Number of disputes	No. of men involved (in 000)	Number of days lost (in 000)
1921	396	600	6,984
1922	278	435	3,973
1923	213	301	5,052
1924	133	312	8,731
1925	134	270	12,578
1926	128	187	1,097
1927	129	132	2,020
1928	203	507	31,647
1929	141	531	12,166
1930	118	196	2,262
1931	166	203	2,408
1932	119	128	1,922
1933	146	165	2,169
1934	159	221	4,776
1935	145	114	973
1936	157	169	2,358
1937	379	648	8,982
1938	399	401	9,199
1939	406	409	4,993

From the above table we find that from 1921 to 1927 the number of strikes showed a decreasing tendency. But in 1928 a big wave of industrial unrest swept throughout the country, which again came down in subsequent years. The number of disputes in this year was higher than in 1924-27. The lowest number on record was in 1932; since then there was an alarming growth of disputes, particularly from 1937-39. The number of men involved also showed a similar tendency except in the years 1924, 1925 and 1929, when this was very high though the number of disputes was comparatively small. This was due to an increase in the number of people involved in major strikes in those years. On the whole the average number of people per strike was higher in the twenties than in the thirties. This was mainly due to some disputes of unusual intensity and duration in the bigger industries like textiles, railways and iron and steel. In the thirties, as already pointed out, the emergence of unrest in the small miscellaneous industrial group brought down this average. As regards the number of days lost, we find that 1928 was by far the worst year, with 1925 and 1929 following far behind. In other years the trend was the same as that of the number of people involved.

The difference between the character of strikes in the twenties and that in the thirties can be explained by economic and administrative considerations. The strikes in twenties were chiefly due to the demand by labourers for a share in the prosperity of the earlier years, and resistance to the reduction of wages during the retrocession of the boom. Politicians and extremist labour leaders took active part in the organisation of these disputes. But the Government did not possess any administrative machinery to settle these disputes, and kept aloof from the struggles except when these disputes became violent and it became necessary to preserve law and order. But the appointment of the Royal Commission on Labour in 1929 and the publication of its report in 1931 stimulated legislative and administrative activity on the part of the Central and Provincial Governments. In this respect the Government of Bombay, the nerve centre for the activities of extreme labour leaders, took the lead in passing the necessary legislation and organising its Labour Department. The complete failure of the general strikes of 1928-29 unnerved the labourers and the prosecution of the extreme labour leaders in the subsequent years brought a lull in this activity. The fall in the general level of prices and in the demand for labour during the depression period, starting with 1930, deterred the labourers from taking risks in strikes. But the revival of prosperity in the economic conditions since the second half of this decade and the advent of popular ministries in the provinces in 1937 brought fresh hopes to the workers. This was followed by the formulation of demands for the restoration of the cut in wages during the depression period and for the redress of other grievances, and by resort to strikes if they were not met.

We may now examine whether these strikes show any seasonal variation. As the number of days lost is of very great economic importance, the number of days lost in each month of the 19 years are tabulated, converted into indices with the monthly average of 1920 as base. For each month the mean-median (the arithmetic mean of the central 3 years when the 19 years

are arranged according to ascending order of the indices) is taken as the average for the period. Now these figures have to be corrected for the general trend. For this purpose a parabola of the second order by Prof. Fisher's method of orthogonal polynomials, is fitted to the annual figures of days lost, which are again converted into indices with 1920 as base. The equation is

$$Y = 93.658 - 2.485t - 0.221(t^2 - 30), \quad t = x - 1930$$

showing that the average number of days lost in the whole period is less than those in the base year, and the annual reduction is about 2½. From a comparison of the observed and expected values, given in Table III, we find that the actual number of days lost was greater than was expected in the years 1924, 1925, 1928, 1929, 1937, 1938, and 1939.

TABLE III

Year.	Indices of actual number of days lost.	Indices of expected days lost.
1921	100.00	104.756
1922	56.88	106.027
1923	72.33	106.856
1924	125.01	107.243
1925	180.09	107.188
1926	15.71	106.691
1927	28.92	105.752
1928	453.11	104.371
1929	174.18	102.548
1930	32.38	100.283
1931	34.48	97.576
1932	27.52	94.427
1933	31.05	90.836
1934	68.37	86.803
1935	13.94	82.328
1936	33.76	77.411
1937	128.60	72.053
1938	131.70	66.251
1939	71.48	60.008

The table IV gives the average value for each month for the period. These monthly figures are corrected for the trend and then adjusted to make the total for 12 months 1200.

TABLE IV

Month.	Mean Median	Corrected (for trend) index	Adjusted Index (for 12,00)	Variation (from 100)	Prof. Madhava's estimate* (for disputes)
Jan.	33.40	33.40	78.32	-21.68	25
Feb.	47.21	47.42	111.20	11.20	-7

Month.	Mean Median	Corrected (for trend) index	Adjusted Index (for 12,00)	Variation (from 100)	Prof. Madhava's estimate* (for disputes)
Mar.	61.09	61.51	144.24	44.24	8
Apr.	55.05	55.68	130.57	30.57	24
May.	52.82	53.66	125.83	25.83	11
Jun.	41.25	42.30	99.19	-0.81	-19
Jul.	33.86	35.12	82.36	-17.64	-7
Aug.	32.17	33.64	78.89	-21.11	-10
Sep.	36.09	37.77	89.57	-11.43	-31
Oct.	41.16	43.05	100.95	0.95	14
Nov.	29.48	31.58	74.06	-25.94	-4
Dec.	34.19	36.50	85.59	-14.41	-5

From the above table we note that there is a definite seasonal trend with a tendency for the loss due to strikes being higher than normal between February and May, and less in all other months except October. It is interesting to note that an analysis of the seasonal variation of the number of disputes by Prof. Madhava gave similar results except for the discrepancy between January and February. But the intensities in different months are different, due to (1) the difference in the period of investigation and perhaps (2) the difference in the variables, in one case the number of strikes and in another the number of days lost.

CAUSES OF DISPUTES

We may now turn our attention to the causes that led to these disputes which are given under the following sub-heads :— (1) pay, (2) bonus, (3) personal, (4) leave and hours and (5) others. Strictly speaking (1) and (2) can be combined, as both refer to the earnings of the workers, and strikes for bonus were numerous in the earlier years. The following table gives the percentage of strikes according to each of the above causes.

TABLE V
(Percentage of Disputes by causes from year to year)

Year.	Pay.	Bonus.	Personal.	Leave & hours.	Others.
1921	42.2	18.9	17.2	2.8	18.9
1922	45.7	11.5	18.0	6.8	18.0
1923	44.6	6.6	25.4	4.2	19.2
1924	39.8	5.3	24.1	3.0	27.8
1925	48.5	4.5	26.1	0.0	20.9
1926	46.9	3.1	24.2	8.6	17.2
1927	47.3	0.0	27.9	3.9	20.9
1928	53.7	0.5	21.7	3.0	21.1

Year.	Pay.	Bonus.	Personal.	Leave & hours.	Others.
1929	38.4	1.4	39.0	2.1	19.1
1930	46.6	2.7	23.0	4.7	23.0
1931	41.6	1.2	23.5	12.0 *	21.7
1932	57.6	2.5	26.3	1.7	11.9
1933	65.1	1.4	13.0	3.4	17.1
1934	67.3	0.6	15.1	3.8	13.2
1935	62.7	1.4	14.5	6.9	14.5
1936	61.2	0.6	15.3	3.8	19.1
1937	61.6	1.1	19.3	3.2	14.8
1938	52.4	0.8	23.0	5.3	18.5
1939	57.1	0.5	18.2	3.0	21.2

We find that the three main causes for strikes were (1) pay, (2) personal and (3) others—in the order of importance. The strikes due to personal causes included sympathetic strikes, strikes for the reinstatement of some dismissed workers, strikes to observe hartals in political movements, etc. The main criticism against strikes in India was that they were not supported by specific demands and frivolous causes contributed a large part to these disputes. The criticism was to some extent true in the twenties; but from 1932 we find an increase in the percentage of strikes for pay and the percentage of strikes on personal grounds was coming down till the triennium 1937-39.

RESULTS

The following table gives the results of the disputes according to (1) successful, (2) partially successful (compromise) and (3) failure.

TABLE VI
PERCENTAGE OF DISPUTES BY RESULTS
FROM YEAR TO YEAR

Year.	Successful.	Partially successful.	Unsuccessful.	Still in progress.
1921	23.2	22.0	53.3	1.5
1922	12.2	9.0	77.3	1.5
1923	16.0	8.9	74.6	0.5
1924	17.3	15.8	66.2	0.7
1925	12.7	20.1	66.4	0.8
1926	9.4	9.4	81.2	0.0
1927	11.6	24.8	61.2	2.4
1928	13.3	20.2	63.1	3.4
1929	22.0	19.1	56.7	1.2
1930	24.3	14.9	60.1	0.7

Year	Successful.	Partially successful.	Unsuccessful.	Still in progress.
1931	13.9	25.3	59.6	1.2
1932	11.9	22.9	62.7	1.5
1933	13.7	15.8	66.4	4.1
1934	20.1	15.7	62.9	1.3
1935	17.2	20.0	60.0	2.8
1936	19.7	27.4	48.4	4.5
1937	13.5	30.9	52.2	3.4
1938	12.8	32.6	51.6	3.0
1939	15.5	35.5	45.6	3.4

From this table we find that throughout the whole period the percentage of successful strikes was very low, being always less than 25 per cent. and often below 20 per cent. Till 1936, the percentage of partially successful strikes also was very low, and the share of failures was very high. This can be accounted for severally: (1) want of proper organisation and staying power among labourers, (2) hastiness of some extremist labour leaders who advised strikes before exhausting all avenues of settlement, (3) want of sufficiently good causes for going on strikes, many being on personal grounds, etc., and finally (4) lack of support and sympathy from the Government which was not responsible to the people. But with the advent of popular Governments since 1937, the share of partially successful strikes increased reducing the percentage of the other two; because the ministers elected by the people wanted to bring amicable settlement to gain popular support. Moreover, some of them were labour leaders in whom the workers had confidence, and they advised caution and exploration of other avenues before taking the extreme step. But even during this period the percentage of unsuccessful strikes was very high, compared with the industrial countries in Europe.

3. STANDARD OF LIVING

For a proper study of the standard of living of the working class people it is necessary to have (1) their wages and (2) the cost of living data. Unfortunately the non-existence in India of comparable statistics of wages and cost of living in different industrial centres handicaps any such study. It is true that some statistics of wages are published in respect of certain industries, and at present we have indices of cost of living of nearly 27 cities in the different provinces of India. But the main information regarding wages is that published by the Bombay Labour Office for important centres like Bombay City, Ahmedabad and Sholapur in that province and the results of the enquiries undertaken for the use of the Royal Commission on Labour in 1928. As regards the index numbers of cost of living, the base periods are widely different. For Bombay the base is the year ending with June 1934; for Ahmedabad the year ending with July 1927; for Sholapur the year ending with January 1928; for Jubbulpore and Nagpur the month of January 1927; for Patna, Muzaffarpur, Monghyr, Jamshedpur, Jharia, Cuttack and Ranchi

the average of the five years ending with 1914 ; for centres in the Punjab 1931-35, for centres in Madras the year ending with June 1936 and for Cawnpore 1939. Thus we find that each province has its own base period. Hence it will be very difficult to compare or aggregate all these into one index. The weights for each centre were fixed on the basis of family budget enquiries. But as these enquiries took place at widely different periods of time, the figures of total expenditure are not comparable. In addition, a good part of the series of indices of cost of living are only of recent origin and a few only are available for a longer period.

In the following table the average monthly expenditure and the percentage of expenditure on main consumption groups to the total expenditure are given for different centres of India.

**DISTRIBUTION OF EXPENDITURE OF WORKING CLASS
FAMILIES IN BOMBAY 1932-33**

Income.	No. of Budgets.	Food.	Fuel	Cloth.	House.	Mis.	Total.
Below 30	186	12.59	2.29	2.41	4.58	5.74	27.60
30-40	297	16.02	2.60	2.84	5.29	7.98	34.72
40-50	385	19.40	3.01	3.22	5.49	10.44	41.57
50-60	239	22.98	3.46	3.76	5.99	12.22	48.42
60-70	147	26.59	3.89	4.32	6.58	14.58	55.96
70-80	77	29.45	4.16	4.67	6.90	17.09	62.27
80-90	60	32.77	4.57	5.51	7.55	19.91	70.31
Above 90	84	39.91	5.54	5.84	9.02	28.44	88.75

MADRAS 1935-36

Below 20	47	10.40	1.70	0.87	2.98	2.28	18.23
20-30	167	14.75	2.04	1.21	3.10	5.09	26.19
30-40	198	18.58	2.34	1.50	3.66	7.74	33.82
40-50	118	22.07	2.73	1.89	4.67	12.43	43.79
50-60	69	25.69	2.93	2.31	5.33	15.90	52.16
60-70	20	30.11	3.49	2.91	6.20	18.98	61.69
Above 70	22	39.71	4.69	3.99	9.92	23.42	81.73

AHMEDABAD

Below 20	10.21	1.76	2.13	2.83	3.84	20.77
20-30	12.37	1.99	2.59	3.65	5.18	25.78
30-40	15.98	2.32	2.98	4.42	7.18	32.89
40-50	19.56	2.66	3.55	4.60	9.33	39.70
50-60	22.59	2.84	4.13	4.23	10.73	44.53
60-70	26.83	3.44	4.81	4.65	12.51	52.24
70-80	29.41	3.68	5.18	5.86	15.07	59.19
80-90	31.96	3.95	5.89	4.59	19.63	66.02
Above 90	42.49	4.74	7.60	6.95	25.94	87.72

	No. of						
Income.	Budgets.	Food.	Fuel.	Cloth.	House.	Mis.	Total.
SHOLAPUR							
Below 20	75	10.25	2.54	2.46	1.58	4.16	20.99
20-30	207	13.32	2.82	3.17	1.97	5.49	26.77
30-40	231	16.92	3.42	4.05	2.22	7.52	34.12
40-50	185	20.27	3.88	4.97	2.58	9.84	41.54
50-60	99	24.39	4.39	5.79	2.64	11.80	49.00
60-70	49	27.33	5.09	6.92	3.32	12.75	55.42
70-80	28	31.21	5.44	7.43	3.38	17.85	65.31
80-90	28	36.15	5.94	8.43	3.94	20.51	74.39

It will be noticed that more than fifty per cent. of the income was spent on food only and over seventy-five per cent. on necessities like food, clothing, rent, fuel and lighting and household requisites, leaving a small margin for miscellaneous items, which include education and recreation. Expenditure on rent is affected by the fact that some workers may get rent-free houses or houses at nominal rents. A more detailed analysis of the expenditure according to its different grades was made by Mr. A. R. Sinha for Bombay and Madras cities.¹ Extending the study to Ahmedabad and Sholapur also, the following results were arrived at.

ANALYSIS OF SOME FAMILY BUDGETS OF INDUSTRIAL WORKERS IN INDIA²

	Bombay 1932-33.	Ahmedabad 1933-35.	Sholapur 1925.	Madras 1935-36.
Average monthly expenditure.	Rs. 45.98	Rs. 40.75	Rs. 37.87	Rs. 37.01
Average proportion of total expenditure on				
(1) Food	0.4660	0.4931	0.4925	0.5262
(2) Fuel & Lighting	0.0711	0.0665	0.0960	0.0666
(3) Housing	0.1281	0.1097	0.1186	0.1114
(4) Clothing	0.0774	0.0912	0.0627	0.0450
(5) Miscellaneous	0.2574	0.2395	0.2302	0.2508
Marginal expenditure on				
(1) Food	0.46	0.49	0.50	0.44
(2) Fuel & Lighting	0.06	0.05	0.07	0.04
(3) Housing	0.07	0.05	0.04	0.10

1. Sinha A. R., *A preliminary study of the distribution of expenditures of working class families in Bombay and Madras cities*, *Sankhya*, Vol. IV, p. 461.

2. Vide *Sankhya*, Vol. IV, p. 461.

Marginal expenditure on

(4) Clothing	0.06	0.08	0.12	0.05
(5) Miscellaneous	0.36	0.34	0.32	0.37

Income Elasticity of Demand

(1) Food	0.985	0.986	1.017	0.836
(2) Fuel & Lighting	0.768	0.692	0.719	0.638
(3) Housing	0.539	0.456	0.320	0.899
(4) Clothing	0.797	0.899	1.882	1.036
(5) Miscellaneous	1.379	1.378	1.382	1.478

From the average proportion of expenditure we find that a higher percentage of money was spent on food in Madras and on fuel, housing and clothing in Bombay centres. This is to a large extent due to the differences in climatic conditions, and also to differences in incomes. The colder climate of Bombay requires more protection to body and the average wages there are also higher. From the elasticity of demand we note that all items except miscellaneous are inelastic, the exception being clothing for Madras and Sholapur and food for Sholapur. The very high figure for clothing and a value slightly over¹ for food for Sholapur, cannot be easily explained. This table clearly shows that the standard of living of Indian workers is very low. Some absolute necessities are included under miscellaneous, and any rise in the wages will be usefully spent on these items.

1. Vide *Sankhya*, Vol. IV, p. 461

Chapter VII

CONCLUSION

WE may now examine the effects of the progress of industrialisation on the National Economy. The Fiscal Commission of 1921 envisaged that the development of industries would result in (1) creating new sources of wealth, (2) encouraging the accumulation of capital, (3) enlarging the public revenues, (4) providing more profitable employment for labour, (5) redeeming the excessive dependence of the country on unstable profits of agriculture and (6) stimulating national life and developing national character. On the other hand several others were afraid that the policy of industrialising the country under tariff protection would result in (1) crippling the customs revenue from import duties, which was the chief source of income to the Central Government, (2) the fall in imports—which will be the result of the policy which would react on the country by the fall in demand for Indian agricultural commodities from foreign countries and thereby result in a fall in the price of these commodities to the detriment of the large class of people who depend upon land, and (3) rise in the prices of imported and locally manufactured goods thereby increasing the cost of living and cost of production for agriculturists. In the following paragraphs it is proposed to consider these different aspects.

IMPORTS DUTIES

While accepting in 1923, the principle that the fiscal policy of the Government of India may legitimately be directed towards fostering the development of industries in India, the Government laid down the limitation "that in the application of the above principle of protection, regard must be had to the financial needs of the country and to the present dependence of the Government of India on import, export and excise duties for a large part of its revenues."¹ This particular anxiety of the Government can be understood when we notice that the contribution of the import duties to the central revenue increased from 17% in 1913 to 58% in 1926-27; and even in 1936-37 after the expansion of many industries the share was as high as 49%. The following table gives the duties paid upon certain important individual items of imports during the decade 1926-27 to 1936-37, these items being responsible for nearly 80% of the total import revenue.

1. L. C. Jain, *The Working of the Protective Tariff in India*, p. 28.

TABLE I
IMPORTANT SOURCES OF IMPORT DUTY

(Rupees in Lakhs)

	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37
Iron and Steel.	328	355	314	261	185	149	146	123	121	135	106
Machinery and Electric instruments.	60	46	21	22	20	82	162	202	217	237	241
Motor spirits.	—	—	—	16	32	67	29	10	5	8	53
Oil.	140	196	216	208	191	231	219	197	230	222	228
Salt.	201	191	202	210	234	292	324	276	238	255	267
Spirits.	262	256	252	254	241	191	221	226	225	231	227
Sugar.	700	650	776	868	1067	798	685	473	387	330	56
Textiles.	970	1016	993	945	615	737	1300	976	1222	1190	1118
Tobacco.	184	211	252	220	121	101	130	112	104	101	128
Vehicles.	168	164	179	174	129	110	120	129	174	174	175
Total.	4103	4129	4227	4207	3667	3756	4477	3818	4077	4089	3753

We find a heavy reduction in the duties paid on sugar and iron and steel, while the duties paid on machinery and instruments, and oil increased rapidly. The duties paid on textiles increased between 1926 and 1932 and later showed a falling tendency. The result of the policy of encouraging industrial production by discriminating protection can be seen best from the following table, which gives the values of the imports and the duties paid on cotton piece-goods, sugar, iron and steel and matches, which were some of the chief protected industries.

TABLE II

Certain important imports subject to Protective Duties
(Rupees in lakhs)

	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37
Import Duty.	1687	1625	1667	1679	1588	1285	1448	1018	980	956	565
Value of protected imports.	8517	8452	8731	8046	4011	2607	2806	1892	2026	2118	1641

We find the value of the goods imported decreased from about Rs. 85 crores in 1926-27 to about Rs. 16 crores in 1936-37 and the duties paid from Rs. 16.87 lakhs to Rs. 5.65 lakhs. Thus the apprehension of the fall in revenue was fully justified; but at the same time it proves the success of the measures taken to foster the growth of those industries. However, the fall on this side was partly made up by the imposition of excise duties on the products of some of the above industries, namely, sugar, matches and steel, the revenue from which is given in table below.

TABLE III

(In lakhs of rupees)

	34-35	35-36	36-37
Sugar.	97	159	253
Matches.	153	229	239
Steel.	12	35	34
	262	423	526

We notice that though the entire loss could not be made up, a good part of it was realised by the excise duties. In addition, the Government increased the scale of revenue duties on articles which were not subject to protective duties and even raw materials and capital goods required for industries which were formerly either on the free list or were paying very small duty had to pay these high duties the increased income through which is noticed in table I. Finally, we must take into consideration the increase in the taxable capacity of some sections of the people whose incomes increased as a result of the salaries paid or profits made in some of the industries. These are partly reflected in the increase in income-tax revenue.

TABLE IV
Income-tax—Received
(Rupees in lakhs)

	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37
Salaries of Companies, etc.	114	118	147	156	147	150	148	142
Debentures, etc.	27	29	38	38	113	33	33	32
Property.	79	80	99	98	91	91	95	92
Business.	866	821	765	693	640	688	747	753
	1086	1048	1049	985	991	962	1023	1019
Salaries of Govt.	172	179	233	211	264	266	266	250
" of local authorities.	9	9	14	15	14	14	13	12
Private employees.	20	19	18	20	20	19	21	18
Interest on Government Securities.	69	84	135	150	86	157	143	120
Professional.	35	34	42	38	34	34	33	33
Other savings.	48	51	60	63	58	58	61	50
Surcharge.			126	250	264	277	206	114
Total	1440	1423	1677	1729	1731	1787	1766	1615
Less Surcharge			(1581)	(1479)	(1467)	(1510)	(1560)	(1501)

Thus the progress of industrialisation reduced the income from import duties on some commodities, brought about a change in the structure of the tariff rates and diversified the sources of income for the Government.

IMPORT TRADE

It was pointed out in the introductory chapter that by the end of the 19th century India was mainly exporting food-stuffs and raw materials and importing manufactured goods in return. The progress made by the industries should naturally have repercussions on the structure of the import trade which is almost sea-borne. The sea-borne imports are classified under five heads, the chief of which are (1) food, drink and tobacco, (2) raw materials and (3) manufactured goods. This crude classification would not facilitate comparisons for studying the effects of industrialisation. This was recognised by the Economic Adviser to the Government of India who classified the items into four categories: (1) articles of general consumption, (2) raw materials of industry, (3) capital goods and (4) luxury goods, in his study on the *Burden of the Indian Tariff*. The following table gives the values of imports under three heads (combining 1 and 4 above)—averages for the quinquenniums from 1909-14 and for individual three years ending with 1936-37.

TABLE V
IMPORTS

GROUP I

(Rupees in crores)

	Average per year							
	1909- 1914	1914- 1919	1919- 1924	1924- 1929	1929- 1934	1934- 1935	1935- 1936	1936- 1937
Cotton manufacture.	48.4	47.5	61.8	56.1	26.0	18.6	17.5	15.0
Kerosene oil.	2.7	2.4	4.4	5.1	4.1	2.6	2.2	2.0
Silk and artificial.	2.7	2.8	4.9	7.3	6.3	6.4	5.4	5.6
Sugar.	12.9	14.6	19.7	17.2	5.1	2.1	1.9	0.2
Provisions, etc.	2.1	2.1	3.0	5.1	3.9	2.9	3.1	3.2
Paper and paste-board.	1.3	2.0	3.5	3.0	2.9	2.7	3.0	2.8
Woollen.	3.2	2.0	2.6	4.3	2.4	3.9	2.8	2.9
Liquors.	2.0	2.4	3.7	5.5	2.8	2.4	2.5	2.4
Drugs and medicines.	0.9	1.2	1.7	1.9	2.0	1.9	2.1	2.1
Glass.	1.6	1.3	2.5	2.5	1.0	1.3	1.4	1.3
Grain.	0.2	0.5	2.7	2.9	2.2	2.7	1.6	0.7
Total.	78.0	78.8	110.5	110.9	59.3	47.4	43.5	38.2

GROUP II

(Rupees in crores)

	Average per year							
	1909- 1914.	1914- 1919.	1919- 1924.	1924- 1929.	1929- 1934.	1934- 1935.	1935- 1936.	1936- 1937.
Machinery.	5.6	5.1	21.6	16.2	13.4	12.6	13.7	14.1
Iron and Steel.	12.5	10.1	21.4	19.1	9.1	6.4	7.2	5.9
Instruments.	1.4	1.7	3.9	4.0	4.4	4.7	5.2	5.2
Chemicals.	0.9	1.9	2.0	2.3	2.7	2.9	3.1	2.7
Hardware.	3.2	2.8	5.8	5.1	3.4	3.1	3.3	2.9
Building Materials.	0.8	1.0	1.7	1.2	0.9	0.6	0.7	0.7
Wood and Timber.	0.8	1.0	1.1	0.7	0.7	0.6	0.5	0.5
Belting for Machinery.	0.4	0.6	0.3	0.4	0.3	0.5	0.5	0.5
Total.	25.6	24.2	57.8	49.0	34.9	31.4	34.2	32.5

GROUP III

(Rupees in crores)

	Average per year							
	1909- 1914.	1914- 1919.	1919- 1924.	1924- 1929.	1929- 1934.	1934- 1935.	1935- 1936.	1936- 1937.
Raw cotton.	1.0	0.4	2.0	4.7	5.5	5.3	6.7	5.8
Cotton yarn.	3.8	4.9	9.3	7.5	3.7	3.1	3.7	2.5

	Average per year.							
	1909- 1914.	1914- 1919.	1919- 1924.	1924- 1929.	1929- 1934.	1934- 1935.	1935- 1936.	1936- 1937.
Other metals.	4.6	2.8	6.8	7.1	4.6	5.0	4.8	3.7
Other oils.	1.2	1.9	3.9	5.3	5.3	4.4	5.1	5.3
Dyes.	1.3	1.1	2.9	2.5	2.5	3.1	3.3	3.0
Raw silk.	1.2	1.1	1.5	1.2	0.6	0.6	0.6	0.6
Raw wool.	0.2	0.2	0.2	0.5	0.2	0.4	0.4	0.6
Rubber.	0.2	1.0	1.8	2.3	2.4	2.1	2.0	1.9
Paper materials.	0.1	0.2	0.3	0.3	0.3	0.3	0.2	0.1
Hides.	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2
Total.	13.9	13.9	28.9	31.6	25.3	24.6	27.0	23.7

Figures for the subsequent years are not given because the separation of Burma makes comparisons difficult. The pre-war period is taken as the starting period because the rapid progress of industrialisation was a product of war and post-war policies. From the table we find that comparing the pre-war quinquennium and 1936-1937, the imports of capital goods increased from Rs. 256 millions to Rs. 325 millions; raw materials from Rs. 139 millions to Rs. 237 millions, while consumption goods fell from Rs. 780 millions to 382 millions. Turning our attention to the individual items in each group, we notice that under capital goods imports of machinery, instruments and chemicals marked the largest increases at 152%, 271% and 200% respectively. There was a fall of 53% in the imports of iron and steel goods due to the development of this industry in the country. If we exclude this item, we find that the value of imports of capital goods increased by 100% in the interval; indeed the volume should be greater considering the variation in prices during the interval. Under raw materials the main increases were in raw cotton, dyes and raw rubber, all of which increased several fold. The main decrease was in cotton yarn which again shows the results of the progress of another protected industry. If we omit this item we find that in raw materials also imports increased by 100% in value. In consumption goods there was a fall of 50%. The main items which contributed to this fall were cotton (70% decrease), and sugar in which imports have become practically negligible. But there were increases in imports of (1) silk and artificial silk, (2) provision and oilman stores, (3) motor cars, (4) liquors, (5) drugs and (6) paper and paste-board. It was pointed out that even in paper, imports in the protected part showed heavy decline. Thus we find that with the rapid industrialisation of the country, the structure of import trade changed considerably. Imports of capital goods, raw materials and luxury goods increased, while imports of articles of general consumption, specially those manufactured in the country, recorded a heavy fall.

EXPORT TRADE

It is a well-known fact that the main part of export trade of India is confined to only six items, namely, raw cotton, raw jute and jute manufactures,

tea, grains, hides and skins which contribute nearly 75% of the value of the total exports. Of these India holds a monopolistic position in jute and its manufactures; rice is the chief grain exported and with the separation of Burma from India this item has lost its importance, because the major export was from Burma, and in fact India is at present a net importer of the commodity. As regards raw cotton, India produces only the short staple variety and exports it mainly to Japan. In oil-seeds, early in this century she used to hold a strong position, and with the increase in the production of these commodities in other tropical possessions of the European powers competition in European markets has increased. Thus when considering the effects of industrialisation on the exports, we should disentangle two important factors. Firstly, the export trade of India is confined largely to a few commodities which are mainly produced in tropical regions and have demand in Europe. The strong position she held in the exports of these commodities was greatly impaired by the growing competition from other tropical regions, which developed later. Secondly, with the onset of the great depression of 1930, an aggressive spirit of national self-sufficiency came to prevail in all the countries of the world, and every country had been trying to become self-sufficient by increased production or by investigating the possibilities of substitutes. Moreover all the European powers having overseas possessions had been trying to encourage the trade with their colonies and dependencies, to the detriment of other countries. Bearing these points in mind, we may examine the trends of foreign exports during the period 1909-1937. No special sub-division as in imports is necessary, because few capital goods are produced in the country, and fewer still for export. The following table gives the exports under the usual heading, (1) food, drink and tobacco, (2) raw materials and (3) manufactured goods.

TABLE VI-A
EXPORTS (Value)
(Rupees in crores)

	1909-1914.	1914-1919.	1919-1924.	1924-1929.	1929-1934.	1934-1935.	1935-1936.	1936-1937.
Grains, etc.	45.8	37.4	32.8	41.8	22.6	11.8	12.4	15.4
Tea.	13.1	17.5	26.9	29.7	21.2	20.1	19.8	20.0
	58.9	54.9	59.7	71.5	43.8	31.9	32.2	35.4
<i>Raw materials.</i>								
Cotton raw.	33.5	33.6	64.7	71.9	36.4	35.0	33.8	44.4
Jute.	22.1	12.8	19.5	31.4	14.4	10.9	13.7	14.8
Ores.	1.1	1.9	3.0	2.5	2.1	2.7	3.7	3.1
Hides and Skins.	14.6	17.1	15.7	16.0	10.6	8.6	9.8	11.8
Lac.	2.2	2.6	8.4	7.1	3.1	3.3	1.6	2.3
Oil-seeds.	2.2	12.2	23.5	27.6	16.8	10.5	10.3	18.5
	75.7	80.2	134.8	156.5	83.4	71.0	72.9	94.9

	1909- 1914.	1914- 1919.	1919- 1924.	1924- 1929.	1929- 1934.	1934- 1935.	1935- 1936.	1936- 1937.
<i>Manufactured goods</i>								
Cotton manufactured.	11.4	11.7	17.1	9.6	5.0	3.1	2.9	3.8
Jute.	20.3	40.2	43.2	54.9	29.8	21.4	23.5	27.9
Metals.	0.5	0.8	2.6	5.4	4.7	3.2	4.1	4.9
	32.2	52.7	62.9	69.9	39.5	27.7	30.5	36.6
All food.	63.0	59.6	59.6	82.7	49.0	36.1	37.1	40.2
Raw.	104.7	86.4	145.0	169.1	89.7	75.2	79.2	102.5
Manufactured.	50.6	68.4	78.0	87.2	52.5	38.5	42.2	49.8
Grand Total.	224.2	225.8	306.3	352.4	198.6	155.0	164.6	202.5
% Food.	28.1	26.4	19.5	23.5	24.7	23.3	22.5	19.9
Raw.	46.7	38.3	47.6	48.0	45.2	48.5	48.1	50.6
Manufactured.	22.6	30.3	25.5	24.7	26.4	24.8	25.6	24.6

TABLE VI-B

QUANTITY OF THE PRINCIPAL ARTICLES OF EXPORT
(in 000's)

Commodity.		Pre-war average.	Post-war average.	1929- 34.	1934- 35.	1935- 36.	1936- 37.
Raw cotton.	Tons.	430	606	544	623	521	762
Raw jute.	"	764	554	665	752	771	821
<i>Oil Seeds.</i>							
Linseed	"	379	251	215	238	165	296
Groundnut.	"	212	195	593	511	413	739
Rape-seed.	"	273	206	64	37	19	38
Sesamum.	"	119	28	5	4	1	14
Copra.	"	31	7	..	..	..	...
Castor.	"	114	48	94	69	60	43
<i>Grains.</i>							
Rice not in husk.	"	2,398	1,452	2,083	1,592	1,394	1,458
Wheat.	"	1,308	237	47	11	10	232
All grains.	Tons.	4,411	2,009	2,333	1,765	1,553	1,877

Commodity.		Pre-war average.	Post-war average.	1929- 34.	1934- 35.	1935- 36.	1936- 37.
Raw hides & skins.	Tons.	78	53	38	40	49	51
Ores.	"	619	685	433	515	793	748
Metals.	"	52	133	641	631	769	860
Jute bags.	000's	339	404	450	423	459	567
Jute cloth.	000 yds.	970	1,270	1,202	1,063	1,218	1,710
Tea.		266	321	354	325	313	302
Cotton Manfd.							
Yarn.	000 lbs.	193	82	20	13	10	12
Piecegoods.	000 yds.	90	164	92	57	70	97

From the above table VI-A we notice that throughout the whole period except during the war, raw materials formed about half of the exports with a slight rising tendency. The share of articles of food had been showing a falling tendency and that of manufactured goods a slight increase. Turning our attention to the individual items in group I we notice that the exports of grains fell considerably in quantity as well as value, specially after the depression of 1930; though the value of export of tea was greater than in the pre-war quinquennium it was less than that of the pre-depression quinquennium. This was mainly due to the fall in price and the quantity exported corroborates this. We have already pointed out that the fall in exports of grain is mainly Burma's problem. In fact with the large increase in India's population, we have been importing large quantities of food-stuffs and in 1934 the Government had to levy import duties on some of the grains like wheat and rice to protect the interests of the growers. Hence any fall in exports of articles of food cannot be to the detriment of the country. Under group II the value of the exports of raw jute, hides and skins and oil-seeds from 1930 was less than even the pre-war average and though the value of exports of raw cotton was slightly higher than in the pre-war period, it was much less than the pre-depression quinquennium. In raw jute also the value of exports had fallen. It must be noted that there was an increase under jute manufactures which compensated for the loss under raw jute. The difference in values of exports of raw cotton and jute between pre-depression and latter years had been mainly due to the precipitous fall in prices, as can be seen from the table of quantity of exports. The reduction in international trade for several reasons was responsible for the fall in demand for jute and its manufactures during the depression period. The fall in the volume of exports of other oil-seeds was more than compensated by groundnuts, and the total quantity of exports of all oil-seeds was maintained. Hence we find that the fall in exports could not be attributed to a fall in demand from countries which lost their markets in India, but to other factors.

The following table gives the exports of cotton to foreign countries and consumption of cotton in the local mills.

COTTON

(Thousand bales of 400 lbs.)

	Pre-war.	1930-1931.	1931-1932.	1932-1933.	1933-1934.	1934-1935.	1935-1936.	1936-1937.
Exports.	2407	3926	2369	2043	2821	3490	3397	4140
Consumption.	...	2266	2342	2379	2290	2553	2609	2612

We find that though the exports had fallen to some extent (for other reasons), the total of these two quantities (exports and consumption) had not changed; and this shows the increased share of the off-take of the mills. Thus the expansion of the indigenous industry was a boon to the cultivators, who would have suffered with the fall in demand for cotton from foreign countries. In fact the large increase in the area and yield of cotton after the great war of 1914-18 was a result of the increased foreign demand, and it was a good thing that the local mills made up for the loss on that account. Moreover this industry stimulated the production of the valuable long staple cotton. Again, in the case of sugar the following table shows the tremendous increase in the area under sugarcane and production of sugar and gur as a result of the development of this industry.

SUGARCANE

Year	Area	Yield 000's Tons
1909-14.	2335	2365
1919-24.	2627	2874
1927-32.	2704	3109
1932-37.	3629	5273

To increase the efficiency of this industry, researches on improved varieties of cane have been made, which have resulted in a larger income to the agriculturists. Though at one time the industrialists of the United Provinces and Bihar tried to take advantage of this increase by reducing prices of sugarcane, the Governments of those provinces stepped in to protect the agriculturists' interests and fixed minimum prices. Thus in these two industries the agriculturists benefited by their progress. Finally from the following table of the index numbers of volume of crop production in India we find that agricultural production increased hand in hand with industrial production, though of course not at the same pace, the annual rate of increase being 0.65%¹ per annum in agriculture, 2.7%² in mineral

1. Dr. Meek. *Some measures of Economic activity in India.* *Journal of the Royal Statistical Society*, 1937, p. 369.

2. *Ibid.*, p. 371.

production and 2.5%¹ in industrial production in the period 1909-34. This was kept up in the succeeding years also.

Thus agricultural production was not adversely affected by industrialisation; on the other hand it was benefited by increased demand for some commodities and researches in increasing the yield of some other crops.

SOME MEASURES OF ECONOMIC ACTIVITY OF INDIA

By Dr. D. B. Meek, C.I.E., O.B.E.

(Vide *Journal of the Royal Statistical Society*, 1937, pp. 363.)

Index No. 34

Year.	crop production.	Volume mineral production.	Industrial production.	Trade.	
	Base: Average of 5 years 1909-1913.	Base: Average of 5 years 1909-1913.	Base: Average of 3 years 1911-1913.	Base: Average of 5 years 1909-1913.	Exports. Imports.
1911-12			93		
1912-13			104		
1913-14			103		
1914-15	105	113	106	71.5	87.5
1915-16	106	117	124	77.8	61.6
1916-17	117	123	125	92.6	46.8
1917-18	118	125	122	84.4	42.5
1918-19	84	136	114	71.3	45.1
1919-20	113	147	120	72.2	57.2
1920-21	90	136	122	56.8	96.0
1921-22	108	138	116	58.3	96.9
1922-23	114	133	120	80.7	84.2
1923-24	107	141	120	103.1	78.7
1924-25	111	150	137	107.8	77.4
1925-26	112	152	136	105.3	79.8
1926-27	112	162	149	92.3	91.6
1927-28	109	172	156	98.3	106.3
1928-29	116	174	137	97.5	113.2
1929-30	117	180	162	95.2	109.6
1930-31	118	182	149	89.8	84.7
1931-32	112	169	160	81.3	67.8
1932-33	116	158	160	73.6	86.5
1933-34	119	159		84.7	77.3
1934-35	105	179		86.2	89.4
1935-36	116	189		87.1	92.0

¹ Ibid., p 374.

TRENDS

Crop production Log (Index No. of production) = $2.0393 + 0.0028 x$

Mineral " " " = $2.1333 + 0.0115 x$

Industrial " " " = $2.1112 + 0.0092 x$

Index No. of exports = $85.2 + 0.581 x$

" imports = $82.3 + 0.660 x$

PRICES

The reaction of industrialisation on the structure of prices can only be indirect. The fall in demand for exports which is to be expected as a consequence of the fall of our imports, should result in a surplus and consequent fall in their prices. But it has already been pointed out above that the quantum of the exports of our chief commodities had not fallen during the period and hence any fall in prices should be attributed to other reasons. In fact in cotton the production was maintained by the increased internal demand, and the large increase in sugarcane production was consequent on the growth of sugar industry. As regards the prices of imported articles, in the first few years they are bound to be at a higher level, but with increasing internal competition and efficiency of production they ought to come down. Unfortunately it is not possible to observe the effect on prices because this period of rapid industrialisation synchronised with a depression of the worst type. But the following table of the index number of wholesale prices of certain important commodities in Calcutta with July 1914 as base reveals certain interesting facts.

TABLE IX
INDEX NUMBERS OF WHOLESALE PRICES IN CALCUTTA

Period.	Food-grains.		Sugar.	Tea.	Other food articles.	Oil-seeds.	Hides & skins.	Metals.
	Cereals.	Pulses						
1914 end of July	100	100	100	100	100	100	100	100
1920 annual average	153	166	407	78	186	173	147	236
1921 " "	144	160	270	100	159	135	108	236
1922 " "	136	152	221	159	188	147	120	172
1923 " "	112	112	246	206	223	138	135	163
1924 " "	121	114	239	205	218	144	124	159
1925 " "	135	128	179	180	187	146	104	125
1926 " "	139	149	178	180	165	134	112	137
1927 " "	139	155	171	165	168	143	119	131
1928 " "	133	157	165	154	157	142	134	124
1929 " "	125	152	162	140	162	155	113	128
1930 " "	100	119	149	114	138	127	87	114
1931 " "	78	89	135	86	111	82	67	109
1932 " "	68	92	146	61	101	76	50	106
1933 " "	66	84	131	95	91	74	59	99
1934 " "	69	84	125	131	97	92	51	101
1935 " "	75	85	128	112	101	107	59	100
1936 " "	79	77	121	125	109	101	70	101
1937 " "	77	89	102	144	125	115	81	144

Period.		Textiles.				Other tex- tiles (Wool & Silk)	Other raw & Manfd.	Build- ing mate- rials. Teak- wood.	All com- modi- ties.
		Jute.		Cotton.					
		Raw.	Manfd.	Raw.	Manfd.				
1914	end of July	100	100	100	100	100	100	100	100
1920	Annual average	104	149	152	325	162	233	140	202
1921	" "	83	104	143	280	142	244	146	179
1922	" "	110	144	191	239	162	236	131	176
1923	" "	90	138	244	221	163	208	120	172
1924	" "	102	159	272	228	146	195	103	173
1925	" "	154	177	205	210	132	166	119	159
1926	" "	120	147	147	173	119	141	132	148
1927	" "	93	146	167	159	126	151	146	148
1928	" "	100	150	167	159	139	138	150	145
1929	" "	95	122	146	160	133	141	151	141
1930	" "	63	88	91	139	85	120	154	116
1931	" "	49	76	83	123	68	101	150	96
1932	" "	45	75	92	119	67	95	130	91
1933	" "	41	77	80	113	64	95	124	87
1934	" "	39	77	73	115	64	95	122	89
1935	" "	50	74	78	117	77	84	113	91
1936	" "	50	64	89	111	94	83	108	91
1937	" "	56	67	89	117	126	92	117	102

We find that the prices of food-grains, specially cereals, and of raw materials—chiefly raw jute, raw cotton and hides and skins—suffered very badly during the depression, and the price level in 1937 was just above the pre-war level. On the other hand the prices of metals, sugar, tea and building materials were far above the pre-war level, and of cotton manufactures and oil-seeds slightly above. Jute manufactures alone of all the manufactured goods of large-scale industry remained below the pre-war level. The aggregate index rose to slightly above pre-war level in 1937 and receded to 95 in the succeeding year. This disparity between the price levels of raw materials and manufactured goods shows that but for industrialisation India would have been worse off, and also that there should be a balanced economy between agriculture and industry.

PRODUCTION AND CONSUMPTION

All the industries considered above, except jute, had been developed with a view to supplying to the home market, displacing the imports of foreign goods. Jute industry depends mainly upon foreign markets for the sale of its products. In this section we may examine the trends of the consumption of the different commodities in the home market. The total consumption of a commodity is (production + imports — exports) + (opening stocks — closing stocks). Unfortunately figures of stocks are not available; but since we are mainly interested in the general

trend and also since the share of the year to year differences of stocks may not be very great compared with the total consumption, that factor also is excluded. In the following, trends of consumption of the products of the six industries (1) cotton, (2) sugar, (3) iron and steel, (4) paper, (5) cement and (6) coal are considered for the pre-war including 1914-18 and the post-war 1919-37 periods. From 1937-38 Burma was separated from India and hence several adjustments have to be made in the figures if we are to include the later years also. As regards jute the trends of exports are given because, figures of production are not available and as has already been pointed out, home consumption of jute products is very little.

PRE-WAR PERIOD

The figures of imports of cement are not given separately during this period. For paper, the classification during this period was entirely different from the succeeding period. Hence these two industries are omitted.

The following table gives the trends got by fitting Fisher's Orthogonal polynomials

Cotton.	$Y = 389.4 + 5.154\xi_1 + 1.346\xi_2$	(Millions of yards)
Jute Bags.	$Y = 378.2 + 29.763\xi_1 + 2.255\xi_2$	(Number in millions)
Jute Cloth.	$Y = 339.4 + 47.737\xi_1 + 1.232\xi_2$	(Millions of yards)
Sugar.	$Y = 529.2 + 20.540\xi_1 + 0.368\xi_2$	(Thousands of tons)
Steel.	$Y = 527.05 + 7.293\xi_1 + 5.385\xi_2$	(" ")
Coal.	$Y = 12.0 + 0.775\xi_1 + 0.012\xi_2$	(" ")
	$\xi_1 = (x - 1909) \quad \xi_2 = \xi_1^2 - 30.$	

A rough idea of the rate of increase in consumption in each industry may be obtained by expressing the coefficient of ξ_1 as a percentage of the constant item. We find that the exports of jute bags (8%) and jute cloth marked the greatest annual increase, next comes the consumption of coal (6%) followed by sugar (4%); steel and cotton follow in order with only 1½% and 1% increase per annum respectively. The rapid rate in increase of exports of jute goods can be explained by the great strides in the expansion of international trade which required packing materials. The expansion of the increase in coal consumption was an index of the development of railway transport and industries in the country during the period. The increase in the consumption of sugar was mainly due to the large imports at low prices, which were chiefly responsible for the fall in indigenous production. Cotton and steel goods marked steady increase in consumption with the growth of population and general prosperity.

POST-WAR PERIOD

The following table gives the trends of consumption during this period; as before for jute the trends of exports are given :—

Cotton.	$Y = 469.7 + 12.992\xi_1 + 0.123\xi_2$	(Millions of yards)
Jute Bags.	$Y = 447.6 + 6.112\xi_1 + 0.547\xi_2$	(Millions of bags)
Jute Cloth.	$Y = 1343.8 + 1.304\xi_1 + 0.035\xi_2$	(Millions of yards)

Sugar.	$Y = 857.2 + 27.196\xi_1 + 0.892\xi_2$	(Thousands of tons)
Steel.	$Y = 1024.6 + 13.496\xi_1 + 2.141\xi_2$	(" ")
Coal.	$Y = 21.1 + 0.126\xi_1 +$	(" ")
Paper.	$Y = 146.3 + 8.753\xi_1 + 0.188\xi_2$	(" ")
Cement.	$Y = 573.1 + 44.998\xi_1 + 0.064\xi_2$	(" ")
$\xi_1 = (x - \text{middle of } 1926 + 27) \xi_2 = \xi_1^2 - 26.9.$		

We find that in all cases the average absolute consumption in post-war period was higher than in the pre-war period; but the per capita consumption is a more reliable index of the rate of consumption: The absolute rate of annual increase of consumption was greater in cotton, sugar, and steel, whereas this came down considerably in jute and coal. If we compare the relative rates as defined above we find that in all cases except cotton, there was a fall, this being naturally heavier in industries which marked lower absolute rate. The two industries which were freshly added during this period, showed very rapid rate of expansion in consumption.

The fall in the rate of exports of jute goods can be explained by (1) reaching of a saturation level in the demand for the commodity, (2) development of the bulk methods of handling and conveying agricultural commodities and (3) the shrinkage of the volume of international trade during the post-war high prices and the depression of the thirties. The fall in the rate of increase of consumption of coal also can be explained by the reduction in the rate of increase of new railway lines and the competition of oil and electricity in some industries and transport. The improvement in general prosperity during the post-war period and the heavy imports of cheap cotton cloth from Japan were responsible for the increase in the rate of consumption of cotton cloth. The high rate of increase in the consumption of paper can again be attributed to the impetus given to education in the reforms period and growth in the reading habit of books and newspapers. The over-production of cement in the first quinquennium of twenties necessitated the establishment of a Marketing Board which was responsible for finding out new uses for the commodity and propagating them. Sugar and steel maintained the steady increase in consumption though at a slower rate. Comparing the two periods, in jute, sugar, coal and steel the relative rates of increase were less in the post-war period than in the pre-war period, and in cotton alone it was greater.

PROTECTION AND DEVELOPMENT OF INDUSTRIES

All the industries that we have studied except jute developed under the shelter of tariff protection; and we have shown the tremendous progress made by them in the home market. It will be useful to examine the objections against such a policy by the advocates of free trade principle. It may be stated even in the beginning that most of these arguments would fall to the ground when it is noted that even such a highly industrialised country like England, the champion of free trade policy for over a century, had to adopt this policy in the thirties on grounds of expediency. The main arguments of free-traders are (1) that it brings maximum benefits to all by encouraging the production of goods at centres

giving maximum returns, (2) that any artificial stimulation by protection tends only to divert the factors of production from one set of industries to another and (3) that the consequent increase in prices throws a burden on the consumers

The basis for the arguments of free trade is the theory of comparative costs. This states that a country will gain by specialising in the production of those commodities in which its comparative cost advantage is greater, exporting those commodities in exchange for those in which its comparative cost advantage is less. On the basis of this principle India is advised by some to concentrate on the production of food-stuffs and raw materials in which its comparative cost advantage is greater and in exchange for them import manufactured goods from countries of the West and Japan. But this assumption implies that the opportunity-cost ratio remains constant. But the recommendation of the Fiscal Commission was that only such industries which could ultimately stand up without the need of protection should be helped for sometime. As Colbert put it, "protective duties are the crutches to teach the new manufactures to walk, and they may teach them this so much earlier than they would have learnt it left to themselves, that the cost of the crutches is more than repaid."¹ This implies a downward slope in the cost curve with progress of time and as the same is not possible in agriculture where the law of diminishing returns is reached at several points, the opportunity-cost ratio is bound to go down after sometime. This with the higher marginal returns in industry compared with agriculture make it more profitable to encourage industrialisation in the long run, though in the short period it means burden and reduced total utility. This point was very well put in the Report of the Fiscal Commission and during the debates in the Indian Legislative Assembly at the time of the adoption of the principle of discriminating protection "As foreign imports dwindle to small proportions, prices will become regulated more and more by internal competition, and the consumer will then begin to derive the benefit from the increased efficiency of the local industry, and may in the end obtain the goods as cheaply as if he were free to import them without a duty. If the industry is one for which the country possesses marked natural advantages, he may obtain them more cheaply."² Pandit Madan Mohan Malaviya speaking on the question of granting protection to the cotton industry pointed out: "It is a very simple question of whether a national industry shall be preserved or helped to grow, or whether we shall allow it to be throttled and killed by foreign competition, because a few of our people will thereby be saved a little money during the time. They will save a little for a time, but they will have to be dependent upon foreign manufactures for their supplies in the years to come and the foreign manufacturer will mercilessly fleece them, even more mercilessly than any other manufacturers."³ At the time of the discussion of the Indian Steel Protection Bill in 1924 Sir Parshotamdas Thakurdas lucidly put the point in the following words: "I think that the whole discussion on this subject

1. L. C. Jain *The Working of the Protective Tariff in India*, p. 11

2. Report of the Fiscal Commission, paragraph 69

3. Indian Legislative Assembly Debates, 6-3-1924, p. 1244.

should be crystallised in a few words. Do we want the policy of protection, protection meaning burden on the present generation in the hope that the benefit thereof will come with compound interest, to the future generations as has been the case in other countries, provided the correct policy is carried through.¹ This extra burden for some period has to be willingly borne to secure a balanced economy without which there could be no true economic progress, because in India there is too little industry in proportion to agriculture. That this optimism was justified is proved by the reports of the different Tariff Boards which investigated the protected industries some years after protection was granted.

About the transfer of the factors of production from one set of products to another set, there need not be any fear of difficulties for the following reasons. The two factors we have to consider in this connection are capital and labour. The great complaint about Indian capital is that it is shy of industrial undertakings and is used mainly in the hoarding of precious metals like silver and gold which yield no return, unless the prices increase enormously as in gold since the thirties or in purchasing lands whose prices were so inflated that the net return in pre-depression years was little. In fact the development of banking and industries opened a fresh field in which the advantage taken by investors is clearly shown in the introductory chapter. Thus there is no fear of scarcity of capital and of competition between industry and agriculture for it. As for labour, it is a notorious fact that there is a large number of unemployed and under-employed people in villages who are simply holding on to land for want of any alternative employment. The main complaint of the advocates of industrialisation is that Government have not been taking sufficient interest in reducing the pressure of these people on agriculture by diverting a part of this labour to industry. Thus this argument of the free traders also does not hold good in the case of India.

Finally coming to the question of the burden on the consumer, it is conceded by all that in the first few years the prices will be high and the burden has to be borne. At the same time the Fiscal Commission pointed out that with the growth of internal competition the prices are bound to fall and reach the competitive level. This was borne out by the reports of the several Tariff Boards which investigated the desirability for the continuation of protection of different industries after an interval of some years. In fact in some industries like sugar, cement, etc., the competition grew so keen that special efforts had to be made to keep the prices at an economic level. Apart from this, the effects of the burden on the consumer will be reflected in the trends of consumption. If the per capita consumption falls it indicates a real burden. From the trends of consumption given we notice that the annual rate of increase of consumption in all cases was greater than the rate of increase of population, showing that the per capita consumption has not fallen. Thus we find that the different adverse effects expected from the development of industries through protection have not materialised and the pessimistic prophets have been proved to be wrong.

1. L. C. Jain, *The Working of the Protective Tariff in India*, p. 12.

Turning now our attention to the positive results, it will be obvious that the national income of the country has increased by the rapid industrialisation, because it has gone on without prejudice to the agricultural production and foreign trade. From the series of index numbers of business activity given before we note that the rate of increase in industries was highest and there was no decline in agricultural production or trade, etc. Unfortunately no census of production has been taken, and there is no possibility of assessing the net output of industry which contributes to the national dividend. But from the trends we notice that its share in the total had been increasing. At the same time it must be remembered that the net addition will be small compared with the vast population of the country. Moreover most of this additional income is very unevenly distributed; a relatively large part has gone to the few capitalists who promoted these industries. This has led to the accumulation of capital which is reflected in the progress of the number and capital of joint-stock companies and also the increased income-tax paid by the incomes from companies, dividends, debentures, Government securities, etc. The income of the State contracted in some directions and expanded in others due to industrialisation. Though the number of people employed in large-scale industries naturally increased, and with the wages here compared with agriculture their incomes also increased considerably, the hopes of people who wanted to divert the pressure of population on agriculture have not been realised because the percentage of people employed on large-scale industries is very small, and even a high rate of increase in the former cannot absorb the ever-growing numbers. But the growth of industries, and with it the organisation of labour in trade unions, etc., fostered keen national spirit. The self-complacent attitude of rural life gave place to a dynamic spirit of progress, and the improvement of the political position, standard of life, etc., of workers in advanced industrial countries awakened a spirit of adventure and progress in the minds of several people.

POST SCRIPT

Here it is proposed to summarise the important changes brought about during the war period.

LOCALISATION OF INDUSTRY

No important changes have occurred in Localisation of individual industries during the war, due to the difficulties of getting new machinery. But the war effort gave stimulus to different industries in varying degrees and this led to differential rates of increase in industrial population in the several regions. The following table gives the percentage of increase in factory employment in important provinces and the percentage share of each in the total number of persons employed in factories.

Province	Percentage increase in 1944 over 1939	Percentage of total in 1939	Percentage of total in 1944
Madras	35	11.3	10.6
Bombay	58	26.6	29.2
Bengal	24	32.7	28.1
U. P.	75	9.1	11.0
Punjab	90	4.5	5.9
Bihar	34	5.5	5.3
C. P.	58	3.7	3.5

From column 2 of the above table we find that relative increase in factory employment was highest in the Punjab followed by U. P., Bombay and C. P. It was least in Bengal. Punjab occupies a very low place with respect to the industrialisation among the different provinces of the country, being responsible for only about 6% of the total persons employed in large scale industries in India. However, during the war, employment in a number of minor engineering and other industries in this province increased rapidly. It has already been noted that the United Provinces had been forging ahead in industries and she took full advantage of the war-time developments. Jute industry was benefited only in the early years of war and other industries of Bengal could not give rise to a very large increase in factory employment. This accounts for the small increase in factory employment in Bengal during the war. The differential rates of increase changed the relative positions of the provinces. Bombay wrested the first position from Bengal, the United Provinces displaced Madras from the third position; and the Punjab became more important than Bihar. Thus only slight shifts in localisation have taken place during the war.

However, the central as well as provincial governments are planning for a more equitable distribution of industries. These plans will have striking effects on new industries rather than established industries like cotton, jute, sugar, etc., where the increase in production can only be a fraction of the existing output. Hydro-electricity is likely to gain more importance in supplying power for industries. There is likely to be a wider dispersion of

industrial population to areas which are at present not important for large scale industries.

SIZE OF INDUSTRIAL UNITS

The physical size of individual units could not be increased during the war due to lack of machinery; but the employment in individual factories increased due to some minor extensions, working at full capacity and also working two and three shifts. Thus, if we measure the size by the number of persons employed, the size of different units should have increased during the war. But as physical size is found to be more important for comparison in different industries, war has not brought about much change in this respect. With the accumulation of capital during the war, flotation of large companies is prominently noticed. There has been a tendency for the purchase of several units by some of these big companies; but these have not changed the size of individual units. There is likely to be an increasing trend in the size of units in the future when machinery becomes available, because with the emergence of these big companies managerial and financial optima for the size of units have increased.

PROGRESS OF INDUSTRIES

The following table shows the progress made in production by the different industries during the war.

	1938- 39	1940- 41	1941- 42	1942- 43	1943- 44	1944- 45	1945- 46	% Change 1944-45 over 1938-39
000 tons								
Cotton piece- goods ¹	4,268	4,269	4,493	4,109	4,870	4,726	4,651	11
Jute manufac- tures ²	1,205	1,108	1,259	1,053	947	975	973	—19
Pig iron	1,576	1,961	2,015	1,804	1,686	1,300	1,044	—19
Finished Steel	932	1,245	1,357	1,253	1,353	1,268	1,338	36
Sugar	765	1,179	805	1,088	1,125	1,082	949	41
Coal	25,000	26,005	26,463	25,470	22,483	24,154	99,060	—3
Cement	1,500	1,721	..	2,183	2,112	2,044	2,146	36
Paper	60	88	..	91	98	100	84	67
	1938)							

Comparing the years 1938-39 and 1944-45 we find that substantial increase

1 Million yards

2 Excluding production on Government account

POST SCRIPT

in production occurred in Paper, Sugar, Cement, Steel and Cotton industries in order of importance. The fall in the production of jute manufactures can be explained by the want of demand for these goods with the shrinkage of international trade; that of pig iron is possibly due to restrictions on trade with Japan; as regards Coal, short supply and the increase in demand are common to all countries. Hence, the remarks made in earlier chapters that the saturation level in demand seems to have been reached in several of these industries proved to be wrong. However, this may be a transient feature due to conditions created by war. The post-war plans for each industry aim at much higher targets of production, based on expected increase in demand with a progressive increase in the standard of living, and also on the ability to withstand foreign competition in the home market as well as neighbouring markets. One cannot be dogmatic about the former and the latter depends upon the extent to which former enemy countries specially Germany and Japan can be kept down in industrial advancement. At any rate, the trends of the pre-war period were on the basis of the then existing economic conditions; and if these conditions change radically, the former expectations and calculations do not hold good.

LABOUR

TRADE UNIONS

The following table gives the number of trade unions which submitted returns under the Act and the total membership of such unions.

Year	Number of unions from which returns under the Act were received	Total membership of the unions shown in column (2)
(1)	(2)	(3)
1937-38	343	390,112
1938-39	394	399,159
1939-40	450	511,138
1940-41	483	513,832
1941-42	455	573,520
1942-43	489	685,299
1943-44	563	780,967
1944-45	573	889,388

This shows that during the period 1937-44, the number of unions increased by 67% and the membership by 128%. Thus the average membership increased from 1137 in 1937-38 to 1552 in 1944-45. In 1944-45 the highest membership was recorded by Bengal followed by Bombay and Madras in order. It is surprising that the membership in an active labour centre as the United Provinces continued to be very small. Railways as in earlier years take the premier place (34%), followed by Textiles (24%). The miscella-

neous group also included a large number (22%). The importance of seamen unions decreased very much.

The following table gives the frequency distribution of these trade unions with reference to membership.

Membership	No. of unions		No. of members	
	Actual number	Percentage to total	Actual number	Percentage to total
Below 50	44	7.7	1,311	0.1
50 and below 100	54	9.4	4,006	0.5
100 and below 300	147	25.6	27,479	3.1
300 and below 500	84	14.6	33,354	3.8
500 and below 1,000	94	16.4	64,034	7.2
1,000 and below 2,000	64	11.2	86,072	9.9
2,000 and below 5,000	52	9.1	1,54,978	17.4
5,000 and below 10,000	16	2.8	1,13,838	12.8
10,000 and below 20,000	9	1.6	1,23,570	13.9
20,000 and over	9	1.6	2,78,746	31.3
Total	573	100.0	8,87,388	100.0

We notice that the "modal class" was 100 to 300 and 25.6% of the total number of trade unions found in this class had a membership of 3% of the total. Unions with a membership between 100 and 1,000 formed 56.6% of the total and their membership is 14.1% of the total. Though only 3% of unions had a membership of over 10 thousand each, their contribution to total membership was only 45% of the total. Here also we find the co-existence of very small and consequently inefficient as well as very big and powerful trade unions.

INDUSTRIAL DISPUTES

The following table gives the data relating to industrial disputes during the war.

	No. of disputes	No. of workers involved ('000)	Man days lost ('000)
1940	322	453	7,577
1941	359	291	3,331
1942	694	773	5,780
1943	716	525	2,342
1944	658	550	3,447
1945	820	748	4,054

We find that the number of disputes and the number of workers involved rose sharply in 1942, but the number of man days lost per dispute or per worker were much smaller. The disputes were mainly for increase in

wages consequent to the rapid increase in cost of living. In 1943, though the number of strikes increased slightly, both the number of workers and days lost were much smaller. In 1945, there was a definite increase in all categories compared with 1943.

CAUSES

From the following table we find that the most important cause for the disputes continued to be wages, and bonus came to importance only after 1942. Strikes for personal (mostly political) reasons came down as the war intensified, but shot up again in 1945. Leave and hours of work also became important causes for the strikes during the war. The miscellaneous group increased only in 1942 and 1943 and came down in subsequent years.

CLASSIFICATION OF DISPUTES BY DEMANDS

Year	No. of Disputes	Wages		Bonus		Personnel		Leave & hrs.		Others	
		No.	%	No.	%	No.	%	No.	%	No.	%
1939	406	232	57	2	1	74	18	12	3	86	21
1940	322	202	63	9	3	54	17	10	3	47	15
1941	359	218	61	9	3	55	15	15	4	62	17
1942	694	359	52	79	11	63	9	7	1	186	27
1943	716	342	48	55	8	53	7	14	2	252	35
1944	194	132	68	11	6	11	6	11	6	29	15
1945	820*	356	43	110	13	145	18	56	7	147	18

RESULTS

The following table gives the results of these disputes.

Successful	Partially Successful	Unsuccessful	Indefinite	In progress
26.7	24.8	46.6	-	1.9
20.9	30.9	46.8	-	1.4
16.9	24.4	54.5	2.5	1.9
19.3	29.3	43.9	6.8	0.7
18.1	26.6	45.1	7.5	2.0
16.3	18.9	45.1	16.5	3.1

We find that the percentage of unsuccessful strikes remained almost stationary at about 45%. The percentage under indefinite increased from year to year due perhaps to prolonged enquiries by Government who evolved elaborate conciliation machinery with a view to checking any adverse effect on their war efforts. The increase under indefinite brought down a fall both in successful and partially successful strikes.

During the recent Great War, labour organisations gathered strength

* Demands not known in 6 cases.

and with the support of the Government they were able to get better terms than during any previous period. In fact, in several cases they could get better terms than even the educated black coated employees. At present the Popular Governments are put to the unenviable task of moderating the demand of the organised labour and keeping up the production with the help of even legislation. But due to war-time scarcities, the increased incomes of labourers could not be used for improving the standard of living. On the other hand, a good part of the earnings were spent in obtaining necessities at high prices in black markets, and some others were frittered away in the purchase of unnecessary items. In 1943, the Director of Cost of Living of the Labour Department of the Government of India, carried out enquiries into the family budgets of working class population in a large number of centres and when these reports are published, they are likely to throw a good deal of light on the standard of living of the workers during the period. The Labour Investigation Committee of the Government of India carried out detailed surveys into the conditions of 36 organised and unorganised industries in India and their reports also throw a good deal of light on the conditions of Labour; but it is not possible to go into the details on the present occasion.

There is no doubt that the recent Great War gave a good opportunity to industrialists to stabilise their position and accumulate capital in spite of the high taxation, etc. The development of industries was, however, arrested by difficulties in importing machinery and parts. The Government did not encourage the establishment of heavy and armament industries as was done in Canada and Australia. In spite of recommendations of experts like Henry Grady, and in the face of grave perils of foreign invasion, the fear of future competition to England prevailed upon the then administrators of the country. The present National Government of India is expected to give a good drive to step up production in all industries and fill up the deficiencies of the industrial structure. No doubt there are several difficulties in the way, namely, the keen foreign competition and non-availability of the required capital goods. However, it must be recognised that the stage is well set for a rapid industrialisation of the country and conditions are propitious for it. It is not proposed to go into problems arising out of the results of the partition of the country and their effects on the future development of industries.

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25	in table on piece-goods. col. 1 row 2.	13	93
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87	col. 1 row 2 of the table	1925-30	1929-30
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93	2 " "	900	9,000
94	1	1100	11,000
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99	col. 1 row 1 of the table	—	1919
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110	2 from the bottom	hoofs and strings	hoops and strips
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135	18	in the Appendix	on pages 138-9
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